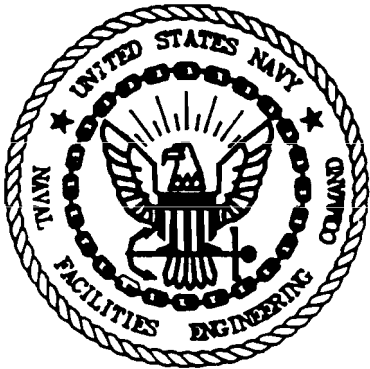


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RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION REPORT
ZONE A VOLUME V OF V APPENDICES E TO G CNC CHARLESTON SC
8/7/1998
ENSAFE

**ZONE A
RCRA FACILITY INVESTIGATION REPORT
NAVBASE CHARLESTON
NORTH CHARLESTON, SOUTH CAROLINA**

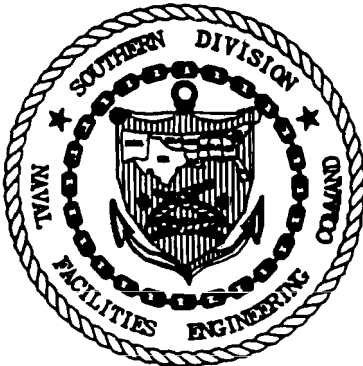


**Volume V of V
Appendices E to G**

**CTO-029
Contract Number: N62467-89-D-0318**

Prepared for:

**Department of the Navy
Southern Division
Naval Facilities Engineering Command
North Charleston, South Carolina**



Prepared by:

**EnSafe Inc.
5724 Summer Trees Drive
Memphis, Tennessee 38134
(901) 372-7962**

**August 7, 1998
Revision: 0**

Release of this document requires prior notification of the Commanding Officer of the Southern Division, Naval Facilities Engineering Command, North Charleston, South Carolina.



HEARTLAND

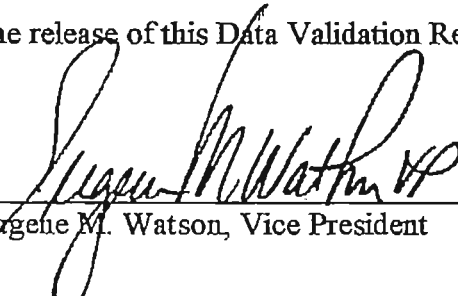
ENVIRONMENTAL SERVICES, INC.

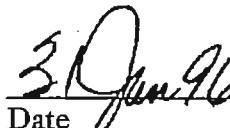
Data Validation Report

SDG#: L5486
Date: January 26, 1996
Client Name: Ensafe, Inc.
Project/Site Name: Charleston Zone A
Date Sampled: September 29, 1995
Number of Samples: 5 Aqueous Sample(s) with 1 MS/MSD(s)
Laboratory: Lockheed Analytical Services
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, June 1991 and February, 1994, respectively
QA/QC Level: EPA DQO Level IV
Method(s) Utilized: SW846 Third Edition
Analytical Fractions: Volatiles, Semivolatiles, Pesticide/PCB's, Gasoline Range Organics, Diesel Range Organics, Metals, and Cyanide

Analytical data in this report were screened to determine usability of results and also to determine contractual compliance relative to these requirements and deliverables. This screening assumes analytical results are correct as reported and merely provides an interpretation of the reported quality control results. A minimum of 10% of all laboratory calculations have been verified as part of this validation. All instrument output, i.e. spectra, chromatograms, etc., for each sample have been carefully reviewed. The end-user is urged to review the Specific Findings and associated Data Qualifications presented in this report. Annotated Form 1s or spreadsheets for all samples reviewed are included after the Data Assessment Narratives. Form 1s for MS/MSD samples or spreadsheets are not annotated.

The release of this Data Validation Report is authorized by the following signature:


Eugene M. Watson, Vice President


Date

SDG# L5486

Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

ENSAFE ID	MATRIX	VOA		SVOA		P/P		GRO		DRO		TAL		CN	
CNSGW00201	WATER	X		X		X						X		X	
CNSGW00401	WATER	X		X		X		X		X		X			
CNSTW00401	WATER	X													
CNSDW00401	WATER	X		X		X		X		X		X		X	
CNSGW00501	WATER	X													
Total Billable Samples (Water/Soil)		5	0	3	0	3	0	2	0	2	0	3	0	2	0

VOA = SW846 Volatiles

SV = SW846 Semivolatiles

P/P = SW846 Pesticide/PCB's

DRO = Diesel Range Organics

GRO = Gasoline Range Organics

TAL = SW846 Metals

CN = SW846 Cyanide

DATA ASSESSMENT NARRATIVES

DATA ASSESSMENT AND NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA SW846, Method 8260 Appendix IX; the National Functional Guidelines for Organic Data Review, June 1991, and DQO Level III. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualifications table.

SDG # L5486

A validation was performed on the Volatile Data from SDG L5486. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibrations
- * • Internal Standard Performance
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- * • Compound Identification /Quantitation

* - All criteria were met for this parameter

Continuing calibrations

The continuing calibrations that were analyzed with this data package exhibited %Ds that were not within %D continuing calibration criteria. All RRFs were within calibration criteria.

**DATA ASSESSMENT AND NARRATIVE
VOLATILE ANALYSIS**

PAGE - 2

Continuing calibrations (continued)

Specific Finding:

The continuing calibration, E2343, contained compounds with %Ds greater than 50% but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

CNGW00201	chloroethane
CNGW00401	

The continuing calibration, E2359, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

CNSTW00401	chloroethane
CNSDW00401	
CNSGW00501	

The continuing calibration, E2359, contained compounds with %Ds greater than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and reject all non detects (R).

CNSTW00401	vinyl acetate
CNSDW00401	
CNSGW00501	

System Performance and Overall Assessment

The overall system performance was fair. The laboratory did not encounter any large problems. The data reviewer estimates that less than 5% of the data is qualified.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
CNGW00201 CNGW00401	chloroethane	+/-	J/UJ
CNSTW00401 CNSDW00401 CNSGW00501	chloroethane	+/-	J/UJ
CNSTW00401 CNSDW00401 CNSGW00501	vinyl acetate	+/-	J/R

DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT AND NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA SW846, Method 8260 Appendix IX; the National Functional Guidelines for Organic Data Review, June 1991, and DQO Level III. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualifications table.

SDG # L5486

A validation was performed on the Volatile Data from SDG L5486. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibrations
- * • Internal Standard Performance
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- * • Compound Identification /Quantitation

* - All criteria were met for this parameter

Continuing calibrations

The continuing calibrations that were analyzed with this data package exhibited %Ds that were not within %D continuing calibration criteria. All RRFs were within calibration criteria.

**DATA ASSESSMENT AND NARRATIVE
VOLATILE ANALYSIS**

PAGE - 2

Continuing calibrations (continued)

Specific Finding:

The continuing calibration, E2343, contained compounds with %Ds greater than 50% but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

CNGW00201	chloroethane
CNGW00401	

The continuing calibration, E2359, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

CNSTW00401	chloroethane
CNSDW00401	
CNSGW00501	

The continuing calibration, E2359, contained compounds with %Ds greater than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and reject all non detects (R).

CNSTW00401	vinyl acetate
CNSDW00401	
CNSGW00501	

System Performance and Overall Assessment

The overall system performance was fair. The laboratory did not encounter any large problems. The data reviewer estimates that less than 5% of the data is qualified.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
CNGW00201 CNGW00401	chloroethane	+/-	J/UJ
CNSTW00401 CNSDW00401 CNSGW00501	chloroethane	+/-	J/UJ
CNSTW00401 CNSDW00401 CNSGW00501	vinyl acetate	+/-	J/R

DL denotes the Form I qualifier supplied by the laboratory

QL denotes the qualifier used by the data validation firm

+ in the DL column denotes a positive result

- in the DL column denotes a non detect result

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA SW846, Method 8270 Appendix IX; National Functional Guidelines for Organic Data Review, and DQO Level III. All comments made within this report should be considered when examining the analytical results (Form I's).

SDG # L5486

A validation was performed on the Semivolatile Data from SDG L5486. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibrations
- * • Internal Standard Performance
- * • Blanks
- Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- Compound Identification /Quantitation

* - All criteria were met for this parameter

Continuing calibrations

The continuing calibrations that were analyzed with this data package exhibited %Ds that were not within %D continuing calibration criteria. All RRFs were within calibration criteria.

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ANALYSIS

PAGE - 2

Continuing calibrations (continued)

Specific Finding:

The continuing calibration, S0201002, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

CNSGW00201	benzyl alcohol	-	=	.
CNSGW00401				
CNSDW00401				

Surrogates

Surrogate recoveries for all samples and blanks did not meet QA/QC criteria. The SOW and the National Functional Guidelines allow one surrogate for each fraction to fall outside the QA/QC criteria as long as the recovery is greater than 10%.

Specific Finding:

Samples CNSGW00201 and CNSGW00201RE, exhibited low surrogate recoveries for two or more surrogates from the acid fraction. Qualify all positive results associated with the acid fraction as estimated (J) and all non detects as estimated (UJ).

Compound Identification/Quantitation

Specific Finding:

Reject all results for CNSGW00201RE, in favor of the original analysis due to non compliant surrogate recoveries..

System Performance and Overall Assessment

The overall system performance was fair. The laboratory did not encounter any large problems. The data reviewer estimates that less than 5% of the data is qualified.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D= Result value is based on the dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value.. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
CNSGW00201 CNSGW00401 CNSDW00401	benzyl alcohol	+/-	J/UJ
CNSGW00201 CNSGW00201RE	All associated analytes acid fraction	+/-	J/UJ
CNSGW00201RE	All analytes	+/-	R

- * DL denotes the Form I qualifier supplied by the laboratory
 QL denotes the qualifier used by the data validation firm
 + in the DL column denotes a positive result
 - in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

CHLORINATED PESTICIDES

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8080; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5486

A validation was performed on the Chlorinated Pesticide Data from SDG L5486. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

System Performance and Overall Assessment

Overall performance was acceptable. The data did not require qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
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NO QUALIFICATIONS WERE REQUIRED

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

TPH AS GASOLINE AND DIESEL

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8015 modified for Gasoline and Diesel analysis; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5486

A validation was performed on the TPH Data from SDG L5486. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

System Performance and Overall Assessment

Overall performance was acceptable. The data did not require qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
------------------	-------------------	-----------	-----------

NO QUALIFICATIONS WERE REQUIRED

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE METALS

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the CLP ILM03.0 Method; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5486W

A validation was performed on the Metals Data from SDG L5486W. The data was evaluated based on the following parameters.

- * ● Data Completeness
- * ● Holding Times
- * ● Calibrations
- Blanks
- * ● Interferences
- Matrix Spike Recovery
- * ● Matrix Duplicates
- * ● Field Duplicates
- * ● Laboratory Control Samples
- Serial Dilutions
- MSAs

* - All criteria were met for this parameter.

Preparation and Field Blanks

Specific Finding

The preparation blank exhibited contamination for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Iron	11.8 ug/l	CNSGW00201
Sodium	90.0 ug/l	no impact
Zinc	9.74 ug/l	CNSGW00201 and 401.

The USEPA requires that all sample values below five times the preparation, field, DI or calibration blank contamination be qualified as estimated, "U". The field or DI water blanks exhibited contamination but had no impact on the data.

Matrix Spike Analysis

Specific Finding

The Matrix Spike recovery for waters for Thallium was below the lower control limits. All positive and non-detect results are qualified as estimated, "J" or "UJ".

Serial Dilution Analysis

Specific Findings

The Serial Dilution for Iron was outside the control limits. All positive results are qualified as estimated, "J".

MSA Analysis

Specific Findings

The post digestion spike recovery for the GFAA analyses were below the lower control limits. All positive and non-detect results are qualified as estimated, "J" or "UJ".

<u>Analyte</u>	<u>Sample IDs</u>	<u>% Recovery</u>
Lead	CNSGW00201	74
Selenium	CNSGW00201	71

Specific Finding

All sample results left with a "B" qualifier after all other qualifications, will be qualified with a "J" qualifier in place of the "B" per Ensafe's request.

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
CNSGW00201	Fe.	+	U
CNSGW00201 and 401.	Zn.		
all samples	Tl.	+ / U	J / UJ
all samples	Fe.	+	J
CNSGW00201	Pb and Se.	+ / U	J / UJ
All "B" results	all analytes	B	J



HEARTLAND

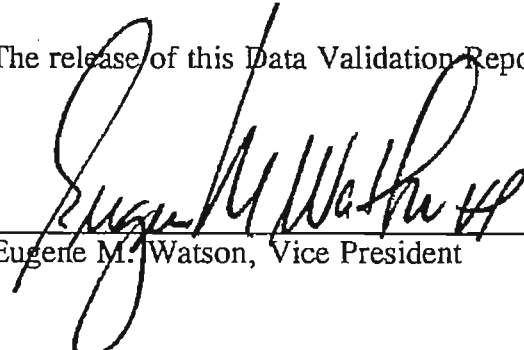
ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: L5495
Date: January 23, 1996
Client Name: Ensafé
Project/Site Name: Charleston Zone A
Date Sampled: September 29, 1995
Number of Samples: 2 Aqueous Sample(s) with 2 MS/MSD(s)
Laboratory: Lockheed Analytical Services
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, June 1991 and February, 1994, respectively
QA/QC Level: EPA DQO Level IV
Method(s) Utilized: SW846 Third Edition Appendix IX
Analytical Fractions: Volatiles, Semivolatiles, Pesticides/PCB's, Gasoline Range Organics, Diesel Range Organics, Metals, Cyanide

Analytical data in this report were screened to determine usability of results and also to determine contractual compliance relative to these requirements and deliverables. This screening assumes analytical results are correct as reported and merely provides an interpretation of the reported quality control results. A minimum of 10% of all laboratory calculations have been verified as part of this validation. All instrument output, i.e. spectra, chromatograms, etc., for each sample have been carefully reviewed. The end-user is urged to review the Specific Findings and associated Data Qualifications presented in this report. Annotated Form 1s or spreadsheets for all samples reviewed are included after the Data Assessment Narratives. Form 1s for MS/MSD samples or spreadsheets are not annotated.

The release of this Data Validation Report is authorized by the following signature:


Eugene M. Watson, Vice President


Date

SDG# L5495

Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

Ensafe ID	Matrix	VOA		SV		P/P		GRO		DRO		TAL		CN	
CNSFW00401	WATER	X		X		X		X		X		X		X	
LS1D474	WATER	X													
Total Billable Samples (Water/Soil)		2	0	1	0	1	0	1	0	1	0	1	0	1	0

VOA= SW846 Volatiles

SV= SW846 Semivolatiles

P/P= SW846 Pesticide/PCB's

GRO= SW846 Gasoline Range Organics

DRO= SW846 Diesel Range Organics

TAL= SW846 Metals

CN= SW846 Cyanide

DATA ASSESSMENT NARRATIVES

DATA ASSESSMENT AND NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA SW846, Method 8260 Appendix IX; the National Functional Guidelines for Organic Data Review, June 1991, and DQO Level IV. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualifications table.

SDG # L5495

A validation was performed on the Volatile Data from SDG L5495. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibrations
- * • Internal Standard Performance
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- * • Compound Identification /Quantitation

* - All criteria were met for this parameter

Continuing calibrations

The continuing calibrations that were analyzed with this data package exhibited %Ds that were not within %D continuing calibration criteria. All RRFs were within calibration criteria.

DATA ASSESSMENT AND NARRATIVE

VOLATILE ANALYSIS

PAGE - 2

Continuing calibrations (continued)

Specific Finding:

The continuing calibration, E2359, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

CNSFN00401	chloroethane
	acetonitrile

The continuing calibration, E2359, contained compounds with RRFs less than 0.05. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and reject all non detects (R).

CNSFN00401	isobutanol
	1,4-dioxane
	pentachloroethane

System Performance and Overall Assessment

The overall system performance was fair. The laboratory did not encounter any large problems. The data reviewer estimates that less than 5% of the data is qualified.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

NJ = Presumptive evidence for the presence of the material at an estimated value

K = Result is biased high

L = Result is biased low

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
CNSFN00401	chloroethane acetonitrile	+/-	J/UJ
CNSFN00401	isobutanol 1,4-dioxane pentachloroethane	+/-	J/R

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA SW846, Method 8270 Appendix IX; National Functional Guidelines for Organic Data Review, and DQO Level IV. All comments made within this report should be considered when examining the analytical results (Form I's).

SDG # L5495

A validation was performed on the Volatile Data from SDG L5495. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibrations
- * • Internal Standard Performance
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- * • Compound Identification /Quantitation

* - All criteria were met for this parameter

Continuing calibrations

The continuing calibrations that were analyzed with this data package exhibited %Ds that were not within %D continuing calibration criteria. All RRFs were within calibration criteria.

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ANALYSIS

PAGE - 2

Continuing calibrations (continued)

Specific Finding:

The continuing calibration, S0201002/301003, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

CNSFW00401 methyl parathion

System Performance and Overall Assessment

The overall system performance was fair. The data package exhibited a contractual non compliances. The laboratory reported in the case narrative that the 120 ng std for one of the initial calibration was outside of calibration criteria, therefore, only a four point calibration was used. Method 8270 requires a minimum of a five point calibration for all compounds page 8270-11, section 5.4. The data reviewer estimates that less than 5% of the data is qualified.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

NJ = Presumptive evidence for the presence of the material at an estimated value

K = Result is biased high

L = Result is biased low

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
CNSFW00401	methyl parathion	+/-	J/UJ

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCLORS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8080; the National Functional Guidelines for Organic Data Validation, June 1991; and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5495

A validation was performed on the Pesticide/Aroclor Data from SDG L5495. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- * • Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 10% of the data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
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NO QUALIFICATIONS ARE REQUIRED.

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE

TPH AS GASOLINE AND DIESEL

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8015 modified for Gasoline and Diesel analysis; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5495

A validation was performed on the TPH Data from SDG L5495. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

System Performance and Overall Assessment

Overall performance was acceptable. The data did not require qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
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NO QUALIFICATIONS WERE REQUIRED.

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

Metals

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, calibration standards, blank analysis results and MS/MSD results. A minimum of ten percent of all laboratory calculations are recalculated by the reviewer. The data validation was performed by the "Laboratory Data Validation Functional Guideline for Evaluating Inorganic Analysis" February, 1994. All comments made within this report should be considered when examining the analytical results (Form Is).

This data package consisted of results from Ensafe, SDG# L5495W, the analysis of one (1) field water samples and no Matrix Spike, Matrix Spike Duplicate and Duplicate pair for TAL Metals and Cyanide. Overall, the inorganic data quality was fair. All protocol requirements were followed with the exception of the following problems.

Specific QA/QC deficiency Findings are listed numerically in the following categories:

Holding Times

The holding times were met as specified in the "Laboratory Data Validation Functional Guideline for Evaluating Inorganic Analysis", February, 1994.

Calibration

No deficiencies in this section.

Preparation and Field Blank

The preparation blank exhibited contamination but had no impact on the data.

Interferences

No significant interferences were observed.

Spike Recovery

1. The Matrix Spike recovery for Thallium was below the lower control limits. All positive and non-detect results are qualified as estimated, "J" or "UJ".

Metals Data Assessment Narrative (continued - Page 2)

Duplicate

No deficiencies in this section.

LCS

No deficiencies in this section.

Serial Dilution

2. The Serial dilution for Iron was outside the control limits. All positive results are qualified as estimated, "J".

MSA

No deficiencies in this section.

3. Ensafé requires that all data points with the "B" qualifier be changed to "J".

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE</u>	<u>DL</u>	<u>QL</u>	<u>SPECIFIC FINDING</u>
All water samples	Tl.	+ /U	J/UJ	1
All water samples	Fe.	+	J	2
All water samples	all analytes	B	J	3

DL - denotes laboratory qualifier/reported value

+ denotes positive values

U denotes non-detect values

QL - denotes data validation qualifier



HEARTLAND

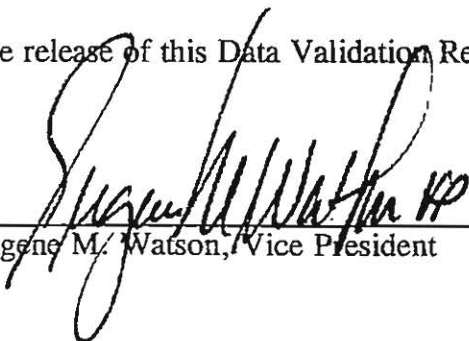
ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: L5505
Date: January 23, 1996
Client Name: Ensafe
Project/Site Name: Charleston Zone A
Date Sampled: October 2, 1995
Number of Samples: 2 Aqueous Sample(s) with 2 MS/MSD(s)
Laboratory: Lockheed Analytical Services
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, June 1991 and February, 1994, respectively
QA/QC Level: EPA DQO Level IV
Method(s) Utilized: SW846 Third Edition Appendix IX
Analytical Fractions: Volatiles, Semivolatiles, Pesticides/PCB's, Gasoline Range Organics, Diesel Range Organics, Cyanide

Analytical data in this report were screened to determine usability of results and also to determine contractual compliance relative to these requirements and deliverables. This screening assumes analytical results are correct as reported and merely provides an interpretation of the reported quality control results. A minimum of 10% of all laboratory calculations have been verified as part of this validation. All instrument output, i.e. spectra, chromatograms, etc., for each sample have been carefully reviewed. The end-user is urged to review the Specific Findings and associated Data Qualifications presented in this report. Annotated Form 1s or spreadsheets for all samples reviewed are included after the Data Assessment Narratives. Form 1s for MS/MSD samples or spreadsheets are not annotated.

The release of this Data Validation Report is authorized by the following signature:



Eugene M. Watson, Vice President



Date

SDG# L5505

Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

Ensafe ID	Matrix	VOA		SV		P/P		GRO		DRO		CN	
039EB01102	WATER	X		X		X		X		X		X	
039DB01102	WATER	X		X		X		X		X		X	
Total Billable Samples (Water/Soil)		2	0	2	0	2	0	2	0	2	0	2	0

VOA= SW846 Volatiles

SV= SW846 Semivolatiles

P/P= SW846 Pesticide/PCB's

GRO= SW846 Gasoline Range Organics

DRO= SW846 Diesel Range Organics

CN= SW846 Cyanide

DATA ASSESSMENT NARRATIVES

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DATA ASSESSMENT AND NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA SW846, Method 8260 Appendix IX; the National Functional Guidelines for Organic Data Review, June 1991, and DQO Level IV. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualifications table.

SDG # L5505

A validation was performed on the Volatile Data from SDG L5505. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibrations
- * • Internal Standard Performance
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- * • Compound Identification /Quantitation

* - All criteria were met for this parameter

Continuing calibrations

The continuing calibrations that were analyzed with this data package exhibited %Ds that were not within %D continuing calibration criteria. All RRFs were within calibration criteria.

DATA ASSESSMENT AND NARRATIVE

VOLATILE ANALYSIS

PAGE - 2

Continuing calibrations (continued)

Specific Finding:

The continuing calibration, E2376, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

039DB01102	chloroethane
039EB01102	acetonitrile

The continuing calibration, E2376, contained compounds with RRFs less than 0.05. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and reject all non detects (R).

039DB01102	isobutanol
039EB01102	1,4-dioxane
	pentachloroethane

System Performance and Overall Assessment

The overall system performance was fair. The laboratory did not encounter any large problems. The data reviewer estimates that less than 5% of the data is qualified.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

NJ = Presumptive evidence for the presence of the material at an estimated value

K = Result is biased high

L = Result is biased low

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
039DB01102	chloroethane	+/-	J/UJ
039EB01102	acetonitrile		
039DB01102	isobutanol	+/-	J/R
039EB01102	1,4-dioxane		
	pentachloroethane		

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA SW846, Method 8270 Appendix IX; National Functional Guidelines for Organic Data Review, and DQO Level IV. All comments made within this report should be considered when examining the analytical results (Form I's).

SDG # L5505

A validation was performed on the Volatile Data from SDG L5505. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibrations
- * • Internal Standard Performance
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- * • Compound Identification /Quantitation

* - All criteria were met for this parameter

Continuing calibrations

The continuing calibrations that were analyzed with this data package exhibited %Ds that were not within %D continuing calibration criteria. All RRFs were within calibration criteria.

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ANALYSIS

PAGE - 2

Continuing calibrations (continued)

Specific Finding:

The continuing calibration, S0201002/301003, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

039EB01102	methyl parathion
039DB01102	

System Performance and Overall Assessment

The overall system performance was fair. The data package exhibited a contractual non compliances. The laboratory reported in the case narrative that the 120 ng std for one of the initial calibration was outside of calibration criteria, therefore, only a four point calibration was used. Method 8270 requires a minimum of a five point calibration for all compounds page 8270-11, section 5.4. The data reviewer estimates that less than 5% of the data is qualified.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

NJ = Presumptive evidence for the presence of the material at an estimated value

K = Result is biased high

L = Result is biased low

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
039EB01102	methyI parathion	+/-	I/UJ
039DB01102			

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCLORS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8080; the National Functional Guidelines for Organic Data Validation, June 1991; and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5505

A validation was performed on the Pesticide/Aroclor Data from SDG L5505. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Continuing Calibrations

Several continuing calibration standards associated with the reported samples exhibited %Ds above the QC limits.

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCLOL ANALYSIS

PAGE - 2

Continuing Calibrations, Continued

Specific Findings

The continuing calibration of 10/17/95 (20:57) contained a compound with a %D greater than 50 % but less than 90 %. For the samples and the non-compliant compound listed below, the positive results are qualified as estimated, J, and the non-detect results are qualified as estimated, UJ.

039EB01102	Isodrin
039DB01102	

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 10% of the data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
039EB01102 039DB01102	Isodrin	+/-	J/UJ

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE

TPH AS GASOLINE AND DIESEL

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8015 modified for Gasoline and Diesel analysis; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5505

A validation was performed on the TPH Data from SDG L5505. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

System Performance and Overall Assessment

Overall performance was acceptable. The data did not require qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
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NO QUALIFICATIONS WERE REQUIRED

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

Metals

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, calibration standards, blank analysis results and MS/MSD results. A minimum of ten percent of all laboratory calculations are recalculated by the reviewer. The data validation was performed by the "Laboratory Data Validation Functional Guideline for Evaluating Inorganic Analysis" February, 1994. All comments made within this report should be considered when examining the analytical results (Form Is).

This data package consisted of results from **Ensafe, SDG# L5505W**, the analysis of two (2) field water samples and no Matrix Spike, Matrix Spike Duplicate and Duplicate pair for TAL Metals and Cyanide. Overall, the inorganic data quality was fair. All protocol requirements were followed with the exception of the following problems.

Specific QA/QC deficiency Findings are listed numerically in the following categories:

Holding Times

The holding times were met as specified in the "Laboratory Data Validation Functional Guideline for Evaluating Inorganic Analysis", February, 1994.

Calibration

No deficiencies in this section.

Preparation and Field Blank

The preparation blank exhibited contamination but had no impact on the data.

Interferences

No significant interferences were observed.

Spike Recovery

No deficiencies in this section.

Metals Data Assessment Narrative (continued - Page 2)

Duplicate

No deficiencies in this section.

LCS

No deficiencies in this section.

Serial Dilution

No deficiencies in this section.

MSA

No deficiencies in this section.

1. Ensafe requires that all data points with the "B" qualifier be changed to "J".

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE</u>	<u>DL</u>	<u>QL</u>	<u>SPECIFIC FINDING</u>
All water samples	all analytes	B	J	1

DL - denotes laboratory qualifier/reported value
+ denotes positive values
U denotes non-detect values

QL - denotes data validation qualifier



HEARTLAND

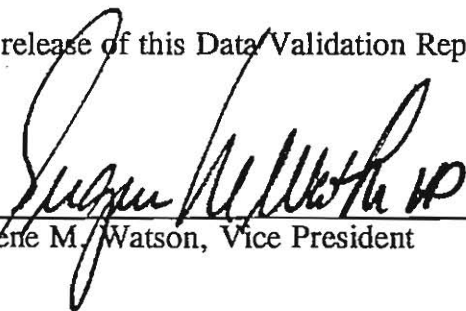
ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: L5506
Date: January 23, 1996
Client Name: Ensafé
Project/Site Name: Charleston Zone A
Date Sampled: October 2, 1995
Number of Samples: 21 Non-aqueous Sample(s) with 4 MS/MSD(s)
Laboratory: Lockheed Analytical Services
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, June 1991 and February, 1994, respectively
QA/QC Level: EPA DQO Level III
Method(s) Utilized: SW846 Third Edition Appendix IX; CLP Multimedia SOW
Analytical Fractions: Volatiles, Semivolatiles, Pesticides/PCB's, Diesel Range Organics, Gasoline Range Organics, Metals

Analytical data in this report were screened to determine usability of results and also to determine contractual compliance relative to these requirements and deliverables. This screening assumes analytical results are correct as reported and merely provides an interpretation of the reported quality control results. A minimum of 10% of all laboratory calculations have been verified as part of this validation. All instrument output, i.e. spectra, chromatograms, etc., for each sample have been carefully reviewed. The end-user is urged to review the Specific Findings and associated Data Qualifications presented in this report. Annotated Form 1s or spreadsheets for all samples reviewed are included after the Data Assessment Narratives. Form 1s for MS/MSD samples or spreadsheets are not annotated.

The release of this Data Validation Report is authorized by the following signature:


Eugene M. Watson, Vice President


Date]

SDG# L5506

Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

Ensafe ID	Matrix	VOA	SV	P/P	GRO	DRO	TAL		
039SB00101	SOIL	X	X	X	X	X	X		
039SB00102	SOIL	X	X	X	X	X	X		
039SB00201	SOIL	X	X	X	X	X	X		
039SB00202	SOIL	X	X	X	X	X	X		
039SB00401	SOIL	X	X	X	X	X	X		
039SB00402	SOIL	X	X	X	X	X	X		
039SB00501	SOIL	X	X	X	X	X	X		
039SB00502	SOIL	X	X	X	X	X	X		
039SB00601	SOIL	X	X	X	X	X	X		
039SB00602	SOIL	X	X	X	X	X	X		
039SB00701	SOIL	X	X	X	X	X	X		
039SB00702	SOIL	X	X	X	X	X	X		
039SB00801	SOIL	X	X	X	X	X	X		
039SB00802	SOIL	X	X	X	X	X	X		
039SB00901	SOIL	X	X	X	X	X	X		
039SB00902	SOIL	X	X	X	X	X	X		
039SB01001	SOIL	X	X	X	X	X	X		
039SB01002	SOIL	X	X	X	X	X	X		
039SB01101	SOIL	X	X	X	X	X	X		
039SB01102	SOIL	X	X	X	X	X	X		
039TE01102	SOIL	X							
Total Billable Samples (Water/Soil)		0	21	0	20	0	20	0	20

VOA = SW846 Volatiles

SV = SW846 Semivolatiles

P/P = SW846 Pesticide/PCB's

GRO = SW846 Gasoline Range Organics

DRO = SW846 Diesel Range Organics

TAL = CLP Metals

DATA ASSESSMENT NARRATIVES

DATA ASSESSMENT AND NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA SW846, Method 8260 Appendix IX; the National Functional Guidelines for Organic Data Review, June 1991, and DQO Level III. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualifications table.

SDG # L5506

A validation was performed on the Volatile Data from SDG L5506. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibrations
- * • Internal Standard Performance
- * • Blanks
- Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- * • Compound Identification /Quantitation

* - All criteria were met for this parameter

Continuing calibrations

The continuing calibrations that were analyzed with this data package exhibited %Ds that were not within %D continuing calibration criteria. All RRFs were within calibration criteria.

**DATA ASSESSMENT AND NARRATIVE
VOLATILE ANALYSIS**

PAGE - 2

Continuing calibrations (continued)

Specific Finding:

The continuing calibration, J3798, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

039SB00201	trichlorofluoromethane
039SB00202	vinyl acetate
039SB00101	

The continuing calibration, J3809, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

039SB00502MS	trichlorofluoromethane
039SB00102	
039SB00602	
039SB00501	
039SB00502	
039SB00502MSD	
039SB00801	

The continuing calibration, J3839, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

039SB00601	trichlorofluoromethane
039SB00401	vinyl acetate
039SB00402	
039SB00802	
039SB00702	
039SB01001	
039SB01002	
039SB00902	
039SB01101	
039SB01102	
039TB01102	

**DATA ASSESSMENT AND NARRATIVE
VOLATILE ANALYSIS**

PAGE - 3

Continuing calibrations (continued)

Specific Finding:

The continuing calibration, J3839, contained compounds with %Ds greater than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and reject all non detects (R).

039SB00601	chloroethane
039SB00401	
039SB00402	
039SB00802	
039SB00702	
039SB01001	
039SB01002	
039SB00902	
039SB01101	
039SB01102	
039TB01102	

The continuing calibration, J3889, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

039SB00701	trichlorofluoromethane
039SB00901	vinyl acetate

The continuing calibration, J3889, contained compounds with %Ds greater than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and reject all non detects (R).

039SB00701	chloroethane
039SB00901	

**DATA ASSESSMENT AND NARRATIVE
VOLATILE ANALYSIS**

PAGE - 4

Internal Standards

All internal standard EICP areas did not meet the internal standard EICP area QA/QC criteria.

Specific Finding:

The Samples listed below, exhibited low internal standard areas. Qualify all associated positive results as estimated (J) and all non detects as estimated (UJ).

039SB00802	1,4-dichlorobenzene-d ₄
039SB01102	
039SB00602	chlorobenzene-d ₅
	1,4-dichlorobenzene-d ₄

Method Blanks

<u>Associated blank</u>	<u>Compound</u>	<u>Concentration</u>
28588MB	ethylbenzene	1.7J ug/Kg
	xylene (total)	1.8J ug/Kg

<u>Samples</u>	<u>Compound</u>	<u>Qualification</u>
039SB00902	xylene (total)	CRQL

Field Blanks

<u>Associated blank</u>	<u>Compound</u>	<u>Concentration</u>
CNSFW00401	benzene	1.6J ug/L
	chloroform	4.7J ug/L

<u>Samples</u>	<u>Compound</u>	<u>Qualification</u>
039SB01101	benzene	CRQL

DATA ASSESSMENT AND NARRATIVE VOLATILE ANALYSIS

PAGE - 5

Surrogates

All of the surrogate recoveries for the all blanks and samples were not within QA/QC limits.

Specific Finding:

The sample 039SB00602, exhibited low surrogate recoveries for toluene-d₈. Qualify all positive results as estimated (J) and all non detects as estimated (UJ).

The sample 039SB00802, exhibited surrogate recoveries that were less than 10%. Qualify all positive results as estimated (J) and reject all non detects (R).

Compound Identification/Quantitation

Specific Finding:

For samples 039SB00101, 039SB00602, 039SB00802 and 039SB01102, reject all E-flagged results in favor of the D-flagged results in the diluted sample. For the diluted samples 039SB00101DL, 039SB00602DL, 039SB00802DL and 039SB01102DL, reject all results (UR) except for the D-flagged results with corresponding E-flagged results.

System Performance and Overall Assessment

The overall system performance was fair. The laboratory did not encounter any large problems. The data reviewer estimates that less than 5 % of the data is qualified.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

NJ = Presumptive evidence for the presence of the material at an estimated value

K = Result is biased high

L = Result is biased low

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
039SB00201	trichlorofluoromethane	+/-	J/UJ
039SB00202	vinyl acetate		
039SB00101			
039SB00502MS	trichlorofluoromethane	+/-	J/UJ
039SB00102			
039SB00602			
039SB00501			
039SB00502			
039SB00502MSD			
039SB00801			
039SB00601	trichlorofluoromethane	+/-	J/UJ
039SB00401	vinyl acetate		
039SB00402			
039SB00802			
039SB00702			
039SB01001			
039SB01002			
039SB00902			
039SB01101			
039SB01102			
039TB01102			
039SB00601	chloroethane	+/-	J/R
039SB00401			
039SB00402			
039SB00802			
039SB00702			
039SB01001			
039SB01002			
039SB00902			
039SB01101			
039SB01102			
039TB01102			

- * DL denotes the Form I qualifier supplied by the laboratory
 QL denotes the qualifier used by the data validation firm
 + in the DL column denotes a positive result
 - in the DL column denotes a non detect result

SUMMARY OF DATA QUALIFICATIONS

Page - 2

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
039SB00701 039SB00901	trichlorofluoromethane vinyl acetate	+/-	J/UJ
039SB00701 039SB00901	chloroethane	+/-	J/R
039SB00802 039SB01102	All associated analytes 1,4-dichlorobenzene-d ₄	+/-	J/UJ
039SB00602	chlorobenzene-d ₅ 1,4-dichlorobenzene-d ₄		
039SB00902	xylene (total)	+	CRQL
039SB01101	benzene	+	CRQL
039SB00602	All analytes	+/-	J/UJ
039SB00802	All analytes	+/-	J/R
039SB00101 039SB00602 039SB00802 039SB01102	All E-flagged results	+/-	UR
039SB00101DL 039SB00602DL 039SB00802DL 039SB01102DL	All results except D-flagged results	+/-	UR

* DL denotes the Form I qualifier supplied by the laboratory
 QL denotes the qualifier used by the data validation firm
 + in the DL column denotes a positive result
 - in the DL column denotes a non detect result

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA SW846, Method 8270 Appendix IX; National Functional Guidelines for Organic Data Review, and DQO Level III. All comments made within this report should be considered when examining the analytical results (Form I's).

SDG # L5506

A validation was performed on the Volatile Data from SDG L5506. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- * • Calibrations
- Internal Standard Performance
- * • Blanks
- Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- * • Compound Identification /Quantitation

* - All criteria were met for this parameter

Internal Standards

All internal standard EICP areas did not meet the internal standard EICP area QA/QC criteria.

Specific Finding:

The Samples listed below, exhibited low internal standard areas. Qualify all associated positive results as estimated (J) and all non detects as estimated (UJ).

039SB00902

1,4-dichlorobenzene-d₄
naphthalene-d₈

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ANALYSIS

PAGE - 2

Surrogates

Surrogate recoveries for all samples and blanks did not meet QA/QC criteria. The SOW and the National Functional Guidelines allow one surrogate for each fraction to fall outside the QA/QC criteria as long as the recovery is greater than 10%.

Specific Finding:

Samples 039SB00902 and 039SB00902RE, exhibited low surrogate recoveries for two or more surrogates from each fraction. Qualify all positive results as estimated (J) and all non detects as estimated (UJ).

Compound Identification/Quantitation

Specific Finding:

Reject all results for 039SB00902, in favor of the re-analyzed due to non compliant internal standard areas and non compliant surrogate recoveries..

For samples 039SB00802, 039SB00501 and 039SB01102, reject all E-flagged results in favor of the D-flagged results in the diluted sample. For the diluted samples 039SB00802DL, 039SB00501DL and 039SB01102DL, reject all results (UR) except for the D-flagged results with corresponding E-flagged results.

System Performance and Overall Assessment

The overall system performance was fair. The laboratory did not encounter any large problems. The data reviewer estimates that less than 5 % of the data is qualified.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

NJ = Presumptive evidence for the presence of the material at an estimated value

K = Result is biased high

L = Result is biased low

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
039SB00902	All associated analytes 1,4-dichlorobenzene-d ₄ naphthalene-d ₈	+/-	J/UJ
039SB00902 039SB00902RE	All analytes	+/-	J/UJ
039SB00902	All analytes	+/-	R
039SB00802 039SB00501 039SB01102	All E-flagged results	+	R
039SB00802DL 039SB00501DL 039SB01102DL	All results except D-flagged results	+/-	R

- * DL denotes the Form I qualifier supplied by the laboratory
 QL denotes the qualifier used by the data validation firm
 + in the DL column denotes a positive result
 - in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCLORS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8080; the National Functional Guidelines for Organic Data Validation, June 1991; and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5506

A validation was performed on the Pesticide/Aroclor Data from SDG L5506. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- Calibration
- * • Blanks
- Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Continuing Calibrations

Several continuing calibration standards associated with the reported samples exhibited %Ds above the QC limits.

DATA ASSESSMENT NARRATIVE
PESTICIDE/AROCLOL ANALYSIS

PAGE - 2

Continuing Calibrations, Continued

Specific Findings

The continuing calibration of 10/24/95 (3:20) contained compounds with %Ds greater than 15% but less than 50%. For the samples and the non-compliant compound listed below, the positive results are qualified as estimated, J.

039SB00401	4,4'-DDE
039SB01001	

The continuing calibration of 10/24/95 (13:35) contained a compound with a %D greater than 15% but less than 50%. For the sample and the non-compliant compound listed below, the positive results are qualified as estimated, J.

039SB01101	4,4'-DDE
------------	----------

The continuing calibration of 10/27/95 (9:26) contained compounds with %Ds greater than 50% but less than 90%. For the samples and the non-compliant compound listed below, the positive results are qualified as estimated, J, and the non-detect results are qualified as estimated, UJ.

039SB01102	Aroclor 1260
------------	--------------

Surrogate Recoveries

Four (4) field samples exhibited non-compliant TCMX and/or DCB recoveries.

Specific Finding

The samples listed below exhibited low TCMX and/or DCB recoveries. The positive results are qualified as estimated, J, and the non-detect results are qualified as estimated, UJ.

039SB00601
039SB00501
039SB00802
039SB01102

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCLOR ANALYSIS

PAGE - 3

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 10% of the data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
039SB00401 039SB01001	4,4'-DDE	+	J
039SB01101	4,4'-DDE	+	J
039SB01102	Aroclor 1260	+/-	J/UJ
039SB00601 039SB00501 039SB00802 039SB01102	ALL	+/-	J/UJ

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE

TPH AS GASOLINE AND DIESEL

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8015 modified for Gasoline and Diesel analysis; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5506

A validation was performed on the TPH Data from SDG L5506. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration
- * • Blanks
- Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Surrogate Recoveries

One sample exhibited recovery below 10%.

Specific Finding

For the following sample, the positive results are qualified as estimated, J, and non-detect results are rejected, R, due to surrogate recovery less than 10%.

039SB00102

**DATA ASSESSMENT NARRATIVE
TPH AS GASOLINE AND DIESEL**

PAGE - 2

System Performance and Overall Assessment

Overall performance was acceptable. The recovery of the spike compound in the MS/MSD could not be calculated due to the high native level of diesel in the sample. The data reviewer estimates that less than 10% of the data required qualifications/rejections.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
039SB00102	all compounds	+/-	J/R

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE METALS

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the CLP ILM03.0 Method; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5506

A validation was performed on the Metals Data from SDG L5506. The data was evaluated based on the following parameters.

- * ● Data Completeness
- * ● Holding Times
- * ● Calibrations
- Blanks
- * ● Interferences
- * ● Matrix Spike Recovery
- Matrix Duplicates
- * ● Field Duplicates
- * ● Laboratory Control Samples
- * ● Serial Dilutions
- MSAs

* - All criteria were met for this parameter.

Preparation and Field Blanks

Specific Finding

The preparation blank exhibited contamination for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Iron	3.23 mg/kg	No impact

The USEPA requires that all sample values below five times the preparation, field, DI or calibration blank contamination be qualified as estimated, "U". The field or DI water blanks exhibited contamination but had no impact on the data.

The preparation blank exhibited negative bias for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Potassium	-139.0 mg/kg	all samples
Vanadium	-0.61 mg/kg	039SB00102, 602, 802 and 1102.

The USEPA requires that the reviewer estimated the impact from negative bias. This reviewer requires that all positive and non-detect results below ten times the negative bias will be qualified as estimated, "J" or "UJ".

Duplicate Analysis

Specific Finding

The Duplicate analysis for Calcium was outside the control limits. All positive results for all water samples are qualified as estimated, "J". The RPDs for Lead and Zinc were not greater than 35% and will not be qualified.

MSAs

Specific Finding

The post digestion spike recovery for GFAA was above the upper control limits. All positive results for the listed samples below are qualified as estimated, "J".

<u>Element</u>	<u>Sample IDs</u>	<u>% recoveries</u>
Arsenic	039SB00101	127
Arsenic	039SB00102	120
Arsenic	039SB00201	124
Arsenic	039SB00202	125
Arsenic	039SB00401	120
Arsenic	039SB00502	122
Arsenic	039SB00602	122
Arsenic	039SB00702	124
Arsenic	039SB00801	123
Arsenic	039SB00802	117
Arsenic	039SB00902	126
Arsenic	039SB01002	124
Arsenic	039SB01102	118

Specific Finding

All sample results left with a "B" qualifier after all other qualifications, will be qualified with a "J" qualifier in place of the "B" per Ensafe's request.

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
all samples	K.	+/U	J/UJ
039SB00102, 602, 801 and 1102.	V.		
all samples	Ca.	+	J
039SB00101, 102, 201, 202, 401, 502, 602, 702, 801, 802, 902, 1002 and 1102.	As.	+	J
All "B" results	all analytes	B	J



HEARTLAND

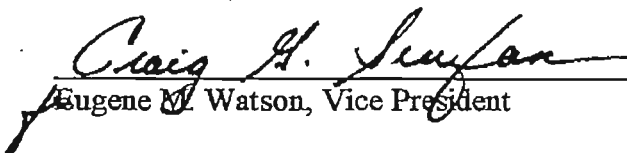
ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: L5509
Date: January 16, 1996
Client Name: Ensafe
Project/Site Name: Charleston Zone A
Date Sampled: October 13 - 28, 1995
Number of Samples: 12 Non-aqueous Sample(s) with 3 MS/MSD(s)
Laboratory: Lockheed Analytical
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, June 1991 and February, 1994, respectively
QA/QC Level: EPA DQO Level IV
Method(s) Utilized: SW846 Third Edition
Analytical Fractions: Volatiles, Semivolatiles, Pesticides/PCB's, Herbicides, Organophosphorus Pesticides, Petroleum Hydrocarbons, Hexavalent Chromium, Metals

Analytical data in this report were screened to determine usability of results and also to determine contractual compliance relative to these requirements and deliverables. This screening assumes analytical results are correct as reported and merely provides an interpretation of the reported quality control results. A minimum of 10% of all laboratory calculations have been verified as part of this validation. All instrument output, i.e. spectra, chromatograms, etc., for each sample have been carefully reviewed. The end-user is urged to review the Specific Findings and associated Data Qualifications presented in this report. Annotated Form 1s or spreadsheets for all samples reviewed are included after the Data Assessment Narratives. Form 1s for MS/MSD samples or spreadsheets are not annotated.

The release of this Data Validation Report is authorized by the following signature:


Eugene M. Watson, Vice President

1-16-96
Date

SDG# L5509

Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

ENSAFE ID	MATR	VOA	SVOA	P/P	HERB	OPP	TPH	HCR	TAL
038-C-B002-01	SOIL	X	X	X	X	X	X	X	X
038-C-B006-01	SOIL	X	X	X	X	X	X	X	X
038-C-B006-01MS	SOIL						X	X	X
038-C-B006-01MSD	SOIL						X	X	X
039-C-B003-01	SOIL	X	X	X	X	X	X	X	X
039-C-B014-01	SOIL	X	X	X	X	X	X	X	X
GDB-C-B001-99	SOIL	X							
GDB-C-B001-99MS	SOIL	X							
GDB-C-B001-99MSD	SOIL	X							
GDA-C-B011-01	SOIL	X	X						
GDA-C-B011-01MS	SOIL	X	X						
GDA-C-B011-01MSD	SOIL	X	X						
Total Billable Samples (Water/		0 10	0 7	0 4	0 4	0 4	0 6	0 6	0 6

VOA = SW846 Volatiles

SV = SW846 Semivolatiles

P/P = SW846 Pesticide/PCB's

HERB = SW846 Herbicides

OPP = SW846 Organophosphorus Pesticides

TPH = SW846 Petroleum Hydrocarbons

HCR = SW846 Hexavalent Chromium

TAL = SW846 Metals

DATA ASSESSMENT NARRATIVES

DATA ASSESSMENT AND NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA SW846, Method 8260 Appendix IX; the National Functional Guidelines for Organic Data Review, June 1991, and DQO Level IV. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualifications table.

SDG # L5509

A validation was performed on the Volatile Data from SDG L5509. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibrations
- Internal Standard Performance
- Blanks
- Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- Compound Identification /Quantitation

* - All criteria were met for this parameter

Initial Calibrations

The initial calibrations that were analyzed by the laboratory for these samples were not acceptable for all compound %RSDs. The average RRFs for all of the criteria compounds met the initial calibration criteria.

DATA ASSESSMENT AND NARRATIVE

VOLATILE ANALYSIS

PAGE - 2

Initial calibrations (continued)

Specific Finding:

The initial calibration analyzed on, 10/13/95, contained compounds with %RSDs greater than 30%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J).

039CB00301	acetone
GDBCB00101	

Continuing calibrations

The continuing calibrations that were analyzed with this data package exhibited %Ds that were not within %D continuing calibration criteria. All RRFs were within calibration criteria.

Specific Finding:

The continuing calibration, I0571, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

039CB01401	acetonitrile
038CB00201	
038CB00601	
GDBCB00101MS	
GDBCB00101MSD	
GDBCB00101RE	

DATA ASSESSMENT AND NARRATIVE

VOLATILE ANALYSIS

PAGE - 3

Internal Standards

All internal standard EICP areas did not meet the internal standard EICP area QA/QC criteria.

Specific Finding:

The Samples listed below, exhibited low internal standard areas. Qualify all associated positive results as estimated (J) and all non detects as estimated (UJ).

GDBCB00101	1,4-dichlorobenzene-d ₄
GDBCB00101RE	
GDBCB00101MS	chlorobenzene-d ₅
GDBCB00101MSD	1,4-dichlorobenzene-d ₄

Method Blanks

<u>Associated blank</u>	<u>Compound</u>	<u>Concentration</u>
28618MB	bromomethane	2.3J ug/Kg
28651MB	2-butanone	1.1 ug/Kg
<u>Samples</u>	<u>Compound</u>	<u>Qualification</u>
039CB00301 GDBCB00101	bromomethane	CRQL
039CB01401 038CB00201	2-butanone	CRQL

DATA ASSESSMENT AND NARRATIVE

VOLATILE ANALYSIS

PAGE - 4

Surrogates

All of the surrogate recoveries for the all blanks and samples were not within QA/QC limits.

Specific Finding:

The samples listed below, exhibited low surrogate recoveries for 1,2-dichloroethane-d₄ and bromofluorobenzene. Qualify all positive results as estimated (J) and all non detects as estimated (UJ).

039CB01401
GDBCB00101
GDBCB00101RE
GDBCB00101MS
GDBCB00101MSD

Compound Identification/Quantitation

Specific Finding:

Reject all results for the sample GDBCB00101RE, due to non compliant internal standard areas.

System Performance and Overall Assessment

The overall system performance was fair. The laboratory did not encounter any large problems. The data reviewer estimates that less than 5% of the data is qualified.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

NJ = Presumptive evidence for the presence of the material at an estimated value

K = Result is biased high

L = Result is biased low

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
039CB00301 GDBCB00101	acetone	+	J
039CB01401 038CB00201 038CB00601 GDBCB00101MS GDBCB00101MSD GDBCB00101RE	acetonitrile	+/-	J/UJ
GDBCB00101 GDBCB00101RE	All associated analytes 1,4-dichlorobenzene-d ₄	+/-	J/UJ
GDBCB00101MS GDBCB00101MSD	chlorobenzene-d ₅ 1,4-dichlorobenzene-d ₄		
039CB00301 GDBCB00101	bromomethane	+	CRQL
039CB01401 038CB00201	2-butanone	+	CRQL
039CB01401 GDBCB00101 GDBCB00101RE GDBCB00101MS GDBCB00101MSD	All analytes	+/-	J/UJ
GDBCB00101RE	All analytes	+/-	R

* DL denotes the Form I qualifier supplied by the laboratory
 QL denotes the qualifier used by the data validation firm
 + in the DL column denotes a positive result
 - in the DL column denotes a non detect result

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA SW846, Method 8270 Appendix IX; National Functional Guidelines for Organic Data Review, and DQO Level IV. All comments made within this report should be considered when examining the analytical results (Form I's).

SDG # L5509

A validation was performed on the Volatile Data from SDG L5509. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibrations
- * • Internal Standard Performance
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- * • Compound Identification /Quantitation

* - All criteria were met for this parameter

Continuing calibrations

The continuing calibrations that were analyzed with this data package exhibited %Ds that were not within %D continuing calibration criteria. All RRFs were within calibration criteria.

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ANALYSIS

PAGE - 2

Continuing calibrations (continued)

Specific Finding:

The continuing calibration, S0201002/301003, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

GDACB01101	methyl parathion
GDACB01101MS	parathion
GDACB01101MSD	
039CB01401	

The continuing calibration, S0201002/301003, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

039CB00301	1,3,5-trinitrobenzene
038CB00201	
038CB00601	

The continuing calibration, S0201002/301003, contained compounds with %Ds greater than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and reject all non detects (R).

039CB00301	methyl parathion
038CB00201	parathion
038CB00601	

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ANALYSIS

PAGE - 3

System Performance and Overall Assessment

The overall system performance was fair. The data package exhibited two contractual non compliances. The first, the laboratory reported in the case narrative that the 120 ng std for one of the initial calibration was outside of calibration criteria, therefore, only a four point calibration was used. Method 8270 requires a minimum of a five point calibration for all compounds page 8270-11, section 5.4. The second, the laboratory submitted a method blank with surrogate recoveries that were less than 5%. The laboratory re-analyzed the blank sample and obtained similar results. The method blank and all associated samples should have been re-extracted, or an explanation should have been provided for the low surrogate recoveries. The surrogate problem appears to be isolated to the method blank, therefore, no qualifications are required. The data reviewer estimates that less than 5% of the data is qualified.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

NJ = Presumptive evidence for the presence of the material at an estimated value

K = Result is biased high

L = Result is biased low

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
GDACB01101 GDACB01101MS GDACB01101MSD 039CB01401	methyl parathion parathion	+/-	J/UJ
039CB00301 038CB00201 038CB00601	1,3,5-trinitrobenzene	+/-	J/UJ
039CB00301 038CB00201 038CB00601	methyl parathion parathion	+/-	J/R

- * DL denotes the Form I qualifier supplied by the laboratory
 QL denotes the qualifier used by the data validation firm
 + in the DL column denotes a positive result
 - in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCLORS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8080; the National Functional Guidelines for Organic Data Validation, June 1991; and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5509

A validation was performed on the Pesticide/Aroclor Data from SDG L5509. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Continuing Calibrations

Several continuing calibration standards associated with the reported samples exhibited %Ds above the QC limits.

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCLOL ANALYSIS

PAGE - 2

Continuing Calibrations, Continued

Specific Findings

The continuing calibration of 11/14/95 (2:41/3:24/4:07) contained compounds with %Ds greater than 50% but less than 90%. For the samples and the non-compliant compounds listed below, the positive results are qualified as estimated, J, and the non-detect results are qualified as estimated, UJ.

038CB00601	Aldrin
039CB00301	Beta-BHC
	Delta-BHC
	Heptachlor Epoxide
	Gamma Chlordane
	Alpha Chlordane
	4,4'-DDE
	Endosulfan II
	Endrin Aldehyde
	Endosulfan Sulfate
	Endrin Ketone
	Kepone

The continuing calibration of 11/14/95 (2:41/3:24/4:07) contained compounds with %Ds greater than 15% but less than 50%. For the sample and the non-compliant compound listed below, the positive results are qualified as estimated, J.

038CB00601	4,4'-DDD
039CB00301	4,4'-DDT

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 10% of the data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
038CB00601	Aldrin	+/-	J/UJ
039CB00301	Beta-BHC		
	Delta-BHC		
	Heptachlor Epoxide		
	Gamma Chlordane		
	Alpha Chlordane		
	4,4'-DDE		
	Endosulfan II		
	Endrin Aldehyde		
	Endosulfan Sulfate		
	Endrin Ketone		
	Kepone		
038CB00601	4,4'-DDD	+	J
039CB00301	4,4'-DDT		

- * DL denotes the Form I qualifier supplied by the laboratory
 QL denotes the qualifier used by the data validation firm
 + in the DL column denotes a positive result
 - in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE

ORGANOPHOSPHORUS PESTICIDES

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8140; the National Functional Guidelines for Organic Data Validation, June 1991; and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5509

A validation was performed on the Herbicide Data from SDG L5509. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Initial Calibrations

Several initial calibration standards associated with the reported samples exhibited correlation coefficients below the QC limit of 0.995.

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCLOR ANALYSIS

PAGE - 2

Initial Calibrations, Continued

Specific Findings

The initial calibration of 10/23/95 contained compounds with correlation coefficients less than 0.990 but greater than 0.850. For the samples and the non-compliant compounds listed below, the positive results are qualified as estimated, J, and the non-detect results are qualified as estimated, UJ.

038CB00601	Thionazin
038CB00201	Phorate
039CB01401	Sulfotep
039CB00301	

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 10% of the data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
038CB00601	Thionazin	+/-	J/UJ
038CB00201	Phorate		
039CB01401	Sulfotep		
039CB00301			

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE

CHLORINATED HERBICIDES

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8150; the National Functional Guidelines for Organic Data Validation, June 1991; and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5509

A validation was performed on the Herbicide Data from SDG L5509. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- * • Calibration
- * • Blanks
- Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Surrogate Recoveries

One (1) field sample exhibited non-compliant surrogate recovery.

Specific Finding

The sample listed below exhibited a low 2,4-dichlorophenylacetic acid recovery. The positive results are qualified as estimated, J, and all non-detect results are qualified as estimated, UJ.

039CB01401

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCLOR ANALYSIS

PAGE - 2

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 10% of the data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
039CB01401	ALL	+/-	J/UJ

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE

TPH AS GASOLINE AND DIESEL

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8015 modified for Gasoline and Diesel analysis; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5509

A validation was performed on the TPH Data from SDG L5509. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

System Performance and Overall Assessment

Overall performance was acceptable. The data did not require qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
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NO QUALIFICATIONS WERE REQUIRED

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE METALS

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the CLP ILM03.0 Method; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5509S

A validation was performed on the Metals Data from SDG L5509S. The data was evaluated based on the following parameters.

- * ● Data Completeness
- * ● Holding Times
- * ● Calibrations
- Blanks
- * ● Interferences
- * ● Matrix Spike Recovery
- Matrix Duplicates
- * ● Field Duplicates
- * ● Laboratory Control Samples
- * ● Serial Dilutions
- * ● MSAs

* - All criteria were met for this parameter.

Preparation and Field Blanks

Specific Finding

The preparation blank exhibited contamination for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Silver	0.78 mg/kg	all soil samples

The USEPA requires that all sample values below five times the preparation, field, DI or calibration blank contamination be qualified as estimated, "U".

The preparation blank exhibited negative bias for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Potassium	-209. mg/kg	all soil samples
Vanadium	-1.97 mg/kg	038CB01401

The USEPA requires the reviewer all negative bias for impact on the samples. This reviewer requires that all positive and non-detect results be qualified as estimated, "J" or "UJ" .

Duplicate Analysis

Specific Finding

The Duplicate analysis for Copper was outside the control limits. All positive results for all soil samples are qualified as estimated, "J". The Duplicate analysis for Mercury was not greater than 2 times the CRDL and will not be qualified.

Specific Finding

All sample results left with a "B" qualifier after all other qualifications, will be qualified with a "J" qualifier in place of the "B" per Ensafe's request.

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
All soil samples	Ag.	+	U
All soil samples	K.	+/U	J/UJ
038CB01401.	V.		
All soil samples	Cu.	+	J
All "B" results	all analytes	B	J



HEARTLAND

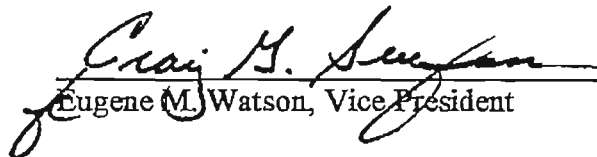
ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: L5530
Date: January 15, 1996
Client Name: Ensafé
Project/Site Name: Charleston Zone A
Date Sampled: October 4 - 14, 1995
Number of Samples: 14 Non-aqueous Sample(s) with 5 MS/MSD(s)
Laboratory: Lockheed Analytical Services
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, June 1991 and February, 1994, respectively
QA/QC Level: EPA DQO Level IV
Method(s) Utilized: SW846 Third Edition
Analytical Fractions: Volatiles, Semivolatiles, Pesticides/Aroclors, Organophosphorus
Pesticides, Herbicides, Hexavalent Chromium, Metals, Cyanide

Analytical data in this report were screened to determine usability of results and also to determine contractual compliance relative to these requirements and deliverables. This screening assumes analytical results are correct as reported and merely provides an interpretation of the reported quality control results. A minimum of 10% of all laboratory calculations have been verified as part of this validation. All instrument output, i.e. spectra, chromatograms, etc., for each sample have been carefully reviewed. The end-user is urged to review the Specific Findings and associated Data Qualifications presented in this report. Annotated Form 1s or spreadsheets for all samples reviewed are included after the Data Assessment Narratives. Form 1s for MS/MSD samples or spreadsheets are not annotated.

The release of this Data Validation Report is authorized by the following signature:


Eugene M. Watson, Vice President

1-16-96
Date

SDG# L5530

Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

ENSAFE ID	MATRIX	VOA	SVOA	P/A	OPP	HERB	HCR	TAL	CN								
507-C-B004-01	SOIL	X	X	X	X	X	X	X	X								
507-C-B004-01MS	SOIL			X													
507-C-B004-01MSD	SOIL			X													
GDB-C-B001-01	SOIL	X	X	X	X	X	X	X									
GDB-C-B001-01MS	SOIL	X															
GDB-C-B001-01MSD	SOIL	X															
GDB-C-B008-01	SOIL	X	X	X	X	X	X	X	X								
GDB-C-B008-01MS	SOIL						X										
GDB-C-B008-01MSD	SOIL						X										
GDA-C-B011-01	SOIL		X														
GDA-C-B011-01MS	SOIL		X														
GDA-C-B011-01MSD	SOIL		X														
038-C-B006-01MS	SOIL							X									
038-C-B006-01MSD	SOIL							X									
Total Billable Samples (Water/Soil)		0	5	0	6	0	5	0	3	0	3	0	5	0	5	0	2

VOA = SW846 Volatiles

SV = SW846 Semivolatiles

P/A SW846 Pesticide/Aroclors

OPP = SW846 Organophosphorus Pesticides

HERB = SW846 Herbicides

HCR = SW846 Hexavalent Chromium

TAL = SW846 Metals

CN = SW846 Cyanide

DATA ASSESSMENT NARRATIVES

DATA ASSESSMENT AND NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA SW846, Method 8260 Appendix IX; the National Functional Guidelines for Organic Data Review, June 1991, and DQO Level IV. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualifications table.

SDG # L5530

A validation was performed on the Volatile Data from SDG L5530. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibrations
- Internal Standard Performance
- Blanks
- Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- Compound Identification /Quantitation

* - All criteria were met for this parameter

Initial Calibrations

The initial calibrations that were analyzed by the laboratory for these samples were not acceptable for all compound %RSDs. The average RRFs for all of the criteria compounds met the initial calibration criteria.

DATA ASSESSMENT AND NARRATIVE

VOLATILE ANALYSIS

PAGE - 2

Initial calibrations (continued)

Specific Finding:

The initial calibration analyzed on, 10/13/95, contained compounds with %RSDs greater than 30%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J).

GDBCB00801

acetone

Continuing calibrations

The continuing calibrations that were analyzed with this data package exhibited %Ds that were not within %D continuing calibration criteria. All RRFs were within calibration criteria.

Specific Finding:

The continuing calibration, I0571, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

507CB00401

acetonitrile

GDBCB00801RE

Internal Standards

All internal standard EICP areas did not meet the internal standard EICP area QA/QC criteria.

Specific Finding:

The Samples listed below, exhibited low internal standard areas. Qualify all associated positive results as estimated (J) and all non detects as estimated (UJ).

GDBCB00801

1,4-dichlorobenzene-d₄

GDBCB00801RE

DATA ASSESSMENT AND NARRATIVE

VOLATILE ANALYSIS

PAGE -3

Method Blanks

<u>Associated blank</u>	<u>Compound</u>	<u>Concentration</u>
28618MB	bromomethane	2.3J ug/Kg

<u>Samples</u>	<u>Compound</u>	<u>Qualification</u>
GDBCB00801	bromomethane	CRQL

Surrogates

All of the surrogate recoveries for the all blanks and samples were not within QA/QC limits.

Specific Finding:

The samples listed below, exhibited low surrogate recoveries for 1,2-dichloroethane-d₄ and bromofluorobenzene. Qualify all positive results as estimated (J) and all non detects as estimated (UJ).

GDBCB00801
GDBCB00801RE

Compound Identification/Quantitation

Specific Finding:

Reject all results for the sample GDBCB00801RE, due to non compliant internal standard areas.

System Performance and Overall Assessment

The overall system performance was fair. The laboratory did not encounter any large problems. The data reviewer estimates that less than 5 % of the data is qualified.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

NJ = Presumptive evidence for the presence of the material at an estimated value

K = Result is biased high

L = Result is biased low

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
GDBCB00801	acetone	+	J
507CB00401 GDBCB00801RE	acetonitrile	+/-	J/UJ
GDBCB00801 GDBCB00801RE	All associated analytes 1,4-dichlorobenzene-d ₄	+/-	J/UJ
GDBCB00801	bromomethane	+	CRQL
GDBCB00801 GDBCB00801RE	All analytes	+/-	J/UJ
GDBCB00801RE	All analytes	+/-	R

- * DL denotes the Form I qualifier supplied by the laboratory
 QL denotes the qualifier used by the data validation firm
 + in the DL column denotes a positive result
 - in the DL column denotes a non detect result

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA SW846, Method 8270 Appendix IX; National Functional Guidelines for Organic Data Review, and DQO Level IV. All comments made within this report should be considered when examining the analytical results (Form I's).

SDG # L5530

A validation was performed on the Volatile Data from SDG L5530. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibrations
- * • Internal Standard Performance
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- * • Compound Identification /Quantitation

* - All criteria were met for this parameter

Continuing calibrations

The continuing calibrations that were analyzed with this data package exhibited %Ds that were not within %D continuing calibration criteria. All RRFs were within calibration criteria.

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ANALYSIS

PAGE - 2

Continuing calibrations (continued)

Specific Finding:

The continuing calibration, S0201002/301003, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

507CB00401	1,3,5-trinitrobenzene
GDBC00801	

The continuing calibration, S0201002/301003, contained compounds with %Ds greater than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and reject all non detects (R).

507CB00401	methyl parathion
GDBC00801	parathion

System Performance and Overall Assessment

The overall system performance was fair. The data package exhibited two contractual non compliances. The first, the laboratory reported in the case narrative that the 120 ng std for one of the initial calibration was outside of calibration criteria, therefore, only a four point calibration was used. Method 8270 requires a minimum of a five point calibration for all compounds page 8270-11, section 5.4. The second, the laboratory submitted a method blank with surrogate recoveries that were less than 5%. The laboratory re-analyzed the blank sample and obtained similar results. The method blank and all associated samples should have been re-extracted or an explanation should have been provided for the low surrogate recoveries. The surrogate problem appears to be isolated to the method blank, therefore, no qualifications are required. The data reviewer estimates that less than 5% of the data is qualified.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

NJ = Presumptive evidence for the presence of the material at an estimated value

K = Result is biased high

L = Result is biased low

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
507CB00401 GDBCB00801	1,3,5-trinitrobenzene	+/-	J/UJ
507CB00401 GDBCB00801	methyl parathion parathion	+/-	J/R

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCLORS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8080; the National Functional Guidelines for Organic Data Validation, June 1991; and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5530

A validation was performed on the Pesticide/Aroclor Data from SDG L5530. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Continuing Calibrations

Several continuing calibration standards associated with the reported samples exhibited %Ds above the QC limits.

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCLOR ANALYSIS

PAGE - 2

Continuing Calibrations, Continued

Specific Findings

The continuing calibration of 11/14/95 (2:41/3:24/4:07) contained compounds with %Ds greater than 50% but less than 90%. For the samples and the non-compliant compounds listed below, the positive results are qualified as estimated, J, and the non-detect results are qualified as estimated, UJ.

GDBCB00101	Aldrin
GDBCB00801	Beta-BHC
	Delta-BHC
	Heptachlor Epoxide
	Gamma Chlordane
	Alpha Chlordane
	4,4'-DDE
	Endosulfan II
	Endrin Aldehyde
	Endosulfan Sulfate
	Kepone

The continuing calibration of 11/14/95 (2:41/3:24/4:07) contained compounds with %Ds greater than 15% but less than 50%. For the sample and the non-compliant compound listed below, the positive results are qualified as estimated, J.

GDBCB00801	4,4'-DDD
	4,4'-DDT

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 10% of the data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
GDBCB00101	Aldrin	+/-	J/UJ
GDBCB00801	Beta-BHC		
	Delta-BHC		
	Heptachlor Epoxide		
	Gamma Chlordane		
	Alpha Chlordane		
	4,4'-DDE		
	Endosulfan II		
	Endrin Aldehyde		
	Endosulfan Sulfate		
	Kepone		
GDBCB00801	4,4'-DDD	+	J
	4,4'-DDT		

- * DL denotes the Form I qualifier supplied by the laboratory
 QL denotes the qualifier used by the data validation firm
 + in the DL column denotes a positive result
 - in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE

CHLORINATED HERBICIDES

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8150; the National Functional Guidelines for Organic Data Validation, June 1991; and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5530

A validation was performed on the Herbicide Data from SDG L5530. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- * • Calibration
- * • Blanks
- Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Surrogate Recoveries

One (1) field sample exhibited non-compliant surrogate recovery.

Specific Finding

The sample listed below exhibited a low 2,4-dichlorophenylacetic acid recovery. The positive results are qualified as estimated, J, and all non-detect results are qualified as estimated, UJ.

GDBCB00101

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCLOR ANALYSIS

PAGE - 2

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 10% of the data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
GDBCB00101	ALL	+/-	J/UJ

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE

ORGANOPHOSPHORUS PESTICIDES

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8140; the National Functional Guidelines for Organic Data Validation, June 1991; and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5530

A validation was performed on the Herbicide Data from SDG L5530. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Initial Calibrations

Several initial calibration standards associated with the reported samples exhibited correlation coefficients below the QC limit of 0.995.

DATA ASSESSMENT NARRATIVE
PESTICIDE/AROCOLOR ANALYSIS

PAGE - 2

Initial Calibrations, Continued

Specific Findings

The initial calibration of 10/23/95 contained compounds with correlation coefficients less than 0.990 but greater than 0.850. For the samples and the non-compliant compounds listed below, the positive results are qualified as estimated, J, and the non-detect results are qualified as estimated, UJ.

GDBCB00801	Thionazin
507CB00401	Phorate
GDBCB00101	Sulfotep

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 10% of the data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
GDBCB00801	Thionazin	+/-	J/UJ
507CB00401	Phorate		
GDBCB00101	Sulfotep		

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE METALS

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the CLP ILM03.0 Method; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5530S

A validation was performed on the Metals Data from SDG L5530S. The data was evaluated based on the following parameters.

- * ● Data Completeness
- * ● Holding Times
- * ● Calibrations
- Blanks
- * ● Interferences
- * ● Matrix Spike Recovery
- Matrix Duplicates
- * ● Field Duplicates
- * ● Laboratory Control Samples
- * ● Serial Dilutions
- * ● MSAs

* - All criteria were met for this parameter.

Preparation and Field Blanks

Specific Finding

The preparation blank exhibited contamination for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Silver	0.78 mg/kg	all soil samples

The USEPA requires that all sample values below five times the preparation, field, DI or calibration blank contamination be qualified as estimated, "U".

The preparation blank exhibited negative bias for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Potassium	-209. mg/kg	507CB00401
Vanadium	-1.97 mg/kg	507CB00401 and GDBCB00801

The USEPA requires the reviewer all negative bias for impact on the samples. This reviewer requires that all positive and non-detect results be qualified as estimated, "J" or "UJ" .

Duplicate Analysis

Specific Finding

The Duplicate analysis for Copper was outside the control limits. All positive results for all soil samples are qualified as estimated, "J". The Duplicate analysis for Mercury was not greater than 2 times the CRDL and will not be qualified.

Specific Finding

All sample results left with a "B" qualifier after all other qualifications, will be qualified with a "J" qualifier in place of the "B" per Ensafe's request.

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
All soil samples	Ag.	+	U
507CB00401.	K.	+ / U	J / UJ
507CB00401 and GDBCB00801.	V.		
All soil samples	Cu.	+	J
All "B" results	all analytes	B	J



HEARTLAND

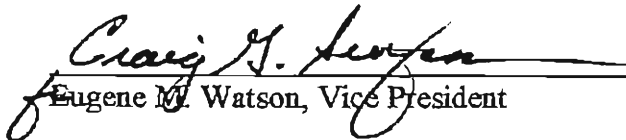
ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: 5542
Date: January 18, 1996
Client Name: Ensafe/Allen & Hoshall
Project/Site Name: Charleston Zone A
Date Sampled: October 5, 1995
Number of Samples: 1 Non-aqueous Sample(s) with 1 MS/MSD(s)
Laboratory: Lockheed Analytical Services
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, June 1991 and February, 1994, respectively
QA/QC Level: EPA DQO Level III
Method(s) Utilized: SW846 Third Edition
Analytical Fractions: Volatiles, Semivolatiles, Pesticides/PCB's, Organophosphorus Pesticides, Herbicides, Hexavalent Chromium, Metals, Cyanide

Analytical data in this report were screened to determine usability of results and also to determine contractual compliance relative to these requirements and deliverables. This screening assumes analytical results are correct as reported and merely provides an interpretation of the reported quality control results. A minimum of 10% of all laboratory calculations have been verified as part of this validation. All instrument output, i.e. spectra, chromatograms, etc., for each sample have been carefully reviewed. The end-user is urged to review the Specific Findings and associated Data Qualifications presented in this report. Annotated Form 1s or spreadsheets for all samples reviewed are included after the Data Assessment Narratives. Form 1s for MS/MSD samples or spreadsheets are not annotated.

The release of this Data Validation Report is authorized by the following signature:


Eugene M. Watson, Vice President

1-19-96
Date

SDG# 5542

Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

ENSAFE ID	MATRIX	VOA		SVOA		P/P		OPP		HERB		HCR		TAL		CN	
GDA-C-B003-02	SOIL		X		X		X		X		X		X		X		X
Total Billable Samples (Water/Soil)		0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1

VOA = SW846 Volatiles

SV = SW846 Semivolatiles

P/P = SW846 Pesticide/PCB's

OPP = SW846 Organophosphorus Pesticides

HERB = SW846 Herbicides

HCR = SW846 Hexavalent Chromium

TAL = SW846 Metals

CN = SW846 Cyanide

DATA ASSESSMENT NARRATIVES

DATA ASSESSMENT NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8240; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5542

A validation was performed on the Volatile Data from SDG L5542. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibration
- Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Internal Standard Performance
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Continuing Calibrations

The continuing calibration analyzed exhibited non-compliant %Ds for compounds which required qualification of the data.

**DATA ASSESSMENT NARRATIVE
VOLATILE ANALYSIS**

PAGE - 2

Continuing Calibrations, continued

Specific Findings

The continuing calibration, I0571.D, contained compounds with %Ds greater than 25 % but less than 50%. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J.

GDACB00302 2-butanone

The continuing calibration, I0571.D, contained compounds with %Ds greater than 50% but less than 90%. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J. and the non-detect results are qualified as estimated, UJ.

GDACB00302 acetonitrile

The continuing calibration, I0571.D, contained compounds with average RRFs less than 0.05. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J, and the non-detect results are rejected, R.

GDACB00302 1,4-dioxane
Isobutanol

Method Blanks

The method blank exhibited contamination for 2-butanone. One (1) sample required qualification.

	28651MB
2-butanone	1.1 µg/Kg

Specific Finding

<u>Samples</u>	<u>Compound</u>	<u>Qualification</u>
GDACB00302	2-butanone	CRQL

**DATA ASSESSMENT NARRATIVE
VOLATILE ANALYSIS**

PAGE - 3

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 10% of data required qualifications/rejections.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
GDACB00302	2-butanone	+	J
GDACB00302	acetonitrile	+/-	J/UJ
GDACB00302	1,4-dioxane Isobutanol	+/-	J/R
GDACB00302	2-butanone	+B	CRQL

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

SEMIVOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8270; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5542

A validation was performed on the Semivolatile Data from SDG L5542. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibration
- Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Internal Standard Performance
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Continuing Calibrations

One (1) of the two (2) continuing calibrations standards analyzed exhibited non-compliant %Ds for two (2) compounds which required qualification of the data.

**DATA ASSESSMENT NARRATIVE
SEMIVOLATILE ANALYSIS**

PAGE - 2

Continuing Calibrations, continued

Specific Findings

The continuing calibration standard, S0301003.D and S0201002.D contained compounds with %Ds greater than 50% but less than 90%. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J, and the non-detect results are qualified as estimated, UJ.

GDACB00302

methyl parathion
parathion

Method Blanks

The surrogate recoveries in the method blank and method blank RE were less than 10% for three (3) of the eight (8) compounds. However, all field samples exhibited acceptable recoveries. TICs were detected in the method blank. All B flagged TICs are rejected.

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 5% of data required qualifications

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
GDACB00302	methyl parathion parathion	+/-	J/UJ

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCLORS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8080; the National Functional Guidelines for Organic Data Validation, June 1991; and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5542

A validation was performed on the Pesticide/Aroclor Data from SDG L5542. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- * • Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 10% of the data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
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NO QUALIFICATIONS ARE REQUIRED.

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE

ORGANOPHOSPHOROUS PESTICIDES

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8140; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5542

A validation was performed on the Organophosphorous Pesticide Data from SDG L5542. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- Calibration
- * • Blanks
- Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Initial Calibrations

The initial calibrations that were analyzed by the laboratory for these samples were not acceptable for all compound correlation coefficients.

**DATA ASSESSMENT NARRATIVE
ORGANOPHOSPHOROUS PESTICIDES**

PAGE - 2

Initial Calibrations, continued

Specific Findings

The initial calibration on 10/23-24/95, contained compounds with correlation coefficients less than 0.990 but greater than 0.850. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J, and the non-detect results are qualified as estimated, UJ.

GDACB00302

thionazin

Phorate

Sulfotepp

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates that 5 % of data required qualifications/rejections.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
GDACB00302	thionazin Phorate Sulfotepp	+/-	J/UJ

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

CHLORINATED HERBICIDES

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-845 Method 8150; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5542

A validation was performed on the Chlorinated Herbicides from SDG L5542. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

System Performance and Overall Assessment

Overall performance was acceptable. The data did not require qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
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NO QUALIFICATIONS WERE REQUIRED

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE METALS

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the CLP ILM03.0 Method; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5542

A validation was performed on the Metals Data from SDG L5542. The data was evaluated based on the following parameters.

- * ● Data Completeness
- * ● Holding Times
- * ● Calibrations
- Blanks
- * ● Interferences
- * ● Matrix Spike Recovery
- * ● Matrix Duplicates
- * ● Field Duplicates
- * ● Laboratory Control Samples
- * ● Serial Dilutions
- * ● MSAs

* - All criteria were met for this parameter.

Preparation and Field Blanks

Specific Finding

The preparation blank exhibited contamination for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Iron	2.60 mg/kg	No impact
Zinc	0.69 mg/kg	No impact

The USEPA requires that all sample values below five times the preparation, field, DI or calibration blank contamination be qualified as estimated, "U". The field or DI water blanks exhibited contamination but had no impact on the data.

The preparation blank exhibited negative bias for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Potassium	-147.0 mg/kg	all samples

The USEPA requires that the reviewer estimated the impact from negative bias. This reviewer requires that all positive and non-detect results below ten times the negative bias will be qualified as estimated, "J" or "UJ".

Duplicate Analysis

Specific Finding

The RPD for Calcium was not greater than 35% and will not be qualified. The field duplicate results were not greater than 50% and will not be qualified.

Specific Finding

All sample results left with a "B" qualifier after all other qualifications, will be qualified with a "J" qualifier in place of the "B" per Ensafe's request.

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
All samples	K.	+/U	J/UJ
All "B" results	all analytes	B	J



HEARTLAND

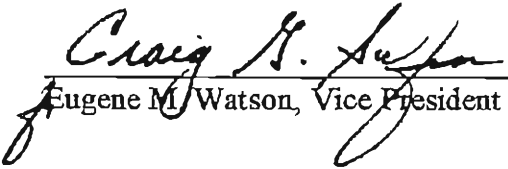
ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: 5545
Date: January 18, 1996
Client Name: Ensafe/Allen & Hoshall
Project/Site Name: Charleston Zone A
Date Sampled: October 5, 1995
Number of Samples: 11 Non-aqueous Sample(s) with 3 MS/MSD(s)
Laboratory: Lockheed Analytical Services
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, June 1991 and February, 1994, respectively
QA/QC Level: EPA DQO Level III
Method(s) Utilized: SW846 Third Edition
Analytical Fractions: Volatiles, Semivolatiles, Pesticides/PCB's, Herbicides, Metals, Cyanide

Analytical data in this report were screened to determine usability of results and also to determine contractual compliance relative to these requirements and deliverables. This screening assumes analytical results are correct as reported and merely provides an interpretation of the reported quality control results. A minimum of 10% of all laboratory calculations have been verified as part of this validation. All instrument output, i.e. spectra, chromatograms, etc., for each sample have been carefully reviewed. The end-user is urged to review the Specific Findings and associated Data Qualifications presented in this report. Annotated Form 1s or spreadsheets for all samples reviewed are included after the Data Assessment Narratives. Form 1s for MS/MSD samples or spreadsheets are not annotated.

The release of this Data Validation Report is authorized by the following signature:


Eugene M. Watson, Vice President

1-19-96
Date

SDG# 5545

Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

ENSAFE ID	MATRIX	VOA	SVOA	P/P	HERB	TAL	CN				
042-S-B001-01	SOIL	X	X	X	X	X	X				
042-S-B001-02	SOIL	X	X	X	X	X	X				
042-T-B001-02	SOIL	X									
GDA-S-B001-01	SOIL	X	X	X		X	X				
GDA-S-B001-02	SOIL	X	X	X		X	X				
GDA-S-B002-01	SOIL	X	X	X		X	X				
GDA-S-B002-02	SOIL	X	X	X		X	X				
GDA-S-B003-01	SOIL	X	X	X		X	X				
GDA-S-B003-02	SOIL	X	X	X		X	X				
001-S-B001-01	SOIL		X								
042-S-B010-01	SOIL				X						
Total Billable Samples (Water/Soil)		0	9	0	9	0	8	0	3	0	8

VOA = SW846 Volatiles

SV = SW846 Semivolatiles

P/P = SW846 Pesticide/PCB's

HERB = SW846 Herbicides

TAL = SW846 Metals

CN = SW846 Cyanide

DATA ASSESSMENT NARRATIVES

DATA ASSESSMENT NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8260; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5545

A validation was performed on the Volatile Data from SDG L5545. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Internal Standard Performance
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Continuing Calibrations

The continuing calibration analyzed exhibited non-compliant %Ds for compounds which required qualification of the data.

**DATA ASSESSMENT NARRATIVE
VOLATILE ANALYSIS**

PAGE - 2

Continuing Calibrations, continued

Specific Findings

The continuing calibration, J3978, contained compounds with %Ds greater than 50% but less than 90%. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J. and the non-detect results are qualified as estimated, UJ.

All Samples	trichlorofluoromethane
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System Performance and Overall Assessment

Overall performance was acceptable. The reviewer noted that the trip blank was analyzed as a soil. The data reviewer estimates less than 5% of data required qualifications/rejections.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
All Samples	trichlorofluoromethane	+/-	J/UJ

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

SEMIVOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8270; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5545

A validation was performed on the Semivolatile Data from SDG L5545. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibration
- Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Internal Standard Performance
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Continuing Calibrations

The continuing calibration standard analyzed exhibited a non-compliant %D for one (1) compound which required qualification of the data.

**DATA ASSESSMENT NARRATIVE
SEMIVOLATILE ANALYSIS**

PAGE - 2

Continuing Calibrations, continued

Specific Findings

The continuing calibration standard, S0201002.D contained compounds with %Ds greater than 50% but less than 90%. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J, and the non-detect results are qualified as estimated, UJ.

GDASB00101	2,2'-oxybis(1-chloropropane)
GDASB00102	
GDASB00301	
GDASB00302	
GDASB00201	
GDASB00202	
042SB00101	
042SB00102	
GDASB00301MS	
GDASB00301MSD	

Method Blanks

The method blank that was analyzed exhibited contamination for di-n-butylphthalate. TICs were detected in the method blanks. All B flagged TICs are rejected.

	28905MB
di-n-butylphthalate	1000 µg/Kg

Specific Finding

<u>Samples</u>	<u>Compound</u>	<u>Qualification</u>
GDASB00302	di-n-butylphthalate	CRQL

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 5% of data required qualifications

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
GDASB00101	2,2'-oxybis(1-chloropro.)	+/-	J/UJ
GDASB00102			
GDASB00301			
GDASB00302			
GDASB00201			
GDASB00202			
042SB00101			
042SB00102			
GDASB00301MS			
GDASB00301MSD			
GDASB00302	di-n-butylphthalate	+B	CRQL

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCLORS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8080; the National Functional Guidelines for Organic Data Validation, June 1991; and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5545

A validation was performed on the Pesticide/Aroclor Data from SDG L5545. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- * • Calibration
- Blanks
- Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Method Blanks

The associated method blank exhibited contamination for the target compound 4,4'-DDT.

	28536MB
4,4'-DDT	6.9 µg/Kg

DATA ASSESSMENT NARRATIVE
PESTICIDE/AROCOR ANALYSIS

PAGE - 2

Method Blanks, Continued

Specific Findings

<u>Samples</u>	<u>Compound</u>	<u>Qualification</u>
042SB00101 042SB00102 GDASB00101 GDASB00202 GDASB00301	4,4'-DDT	U
GDASB00102	4,4'-DDT	CRQL

Surrogate Recoveries

Several field samples exhibited non-compliant TCMX or DCB recoveries. Qualifications are required for only one sample.

Specific Finding

The sample listed below exhibited a low DCB recovery. The positive results are qualified as estimated, J, and the non-detect results are qualified as estimated, UJ.

GDASB00201

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 10% of the data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
042SB00101 042SB00102 GDASB00101 GDASB00202 GDASB00301	4,4'-DDT	+	U
GDASB00102	4,4'-DDT	+	CRQL
GDASB00201	ALL	+/-	J/UJ

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE

CHLORINATED HERBICIDES

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8150; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5545

A validation was performed on the Chlorinated Herbicides from SDG L5545. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- Calibration
- * • Blanks
- Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Initial Calibrations

The initial calibrations that were analyzed by the laboratory for these samples were not acceptable for all compound correlation coefficients.

**DATA ASSESSMENT NARRATIVE
CHLORINATED HERBICIDES**

PAGE - 2

Initial Calibrations, continued

Specific Findings

The initial calibration on 10/27/95, contained compounds with correlation coefficients less than 0.990 but greater than 0.850. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J, and the non-detect results are qualified as estimated, UJ.

All Samples	dalapon
-------------	---------

Surrogate Recoveries

One (1) sample required qualifications based on non-compliant surrogate recoveries.

Specific Findings

The following sample exhibited surrogate recovery below the QC limits. All positive and non-detect results in the following sample are qualified as estimated, J/UJ.

042SB00102

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates that 5 % of data required qualifications/rejections.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
All Samples	dalapon	+/-	J/UJ
042SB00102	All compounds	+/-	J/UJ

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE METALS

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the CLP ILM03.0 Method; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5545

A validation was performed on the Metals Data from SDG L5545. The data was evaluated based on the following parameters.

- * ● Data Completeness
- * ● Holding Times
- * ● Calibrations
- Blanks
- * ● Interferences
- * ● Matrix Spike Recovery
- * ● Matrix Duplicates
- * ● Field Duplicates
- * ● Laboratory Control Samples
- * ● Serial Dilutions
- MSAs

* - All criteria were met for this parameter.

Preparation and Field Blanks

Specific Finding

The preparation blank exhibited contamination for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Iron	2.60 mg/kg	No impact
Zinc	0.69 mg/kg	No impact

The USEPA requires that all sample values below five times the preparation, field, DI or calibration blank contamination be qualified as estimated, "U". The field or DI water blanks exhibited contamination but had no impact on the data.

The preparation blank exhibited negative bias for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Potassium	-139.0 mg/kg	all samples

The USEPA requires that the reviewer estimated the impact from negative bias. This reviewer requires that all positive and non-detect results below ten times the negative bias will be qualified as estimated, "J" or "UJ".

Duplicate Analysis

Specific Finding

The RPD for Calcium was not greater than 35% and will not be qualified.

MSAs

Specific Finding

The post digestion spike recovery for GFAA was below the lower control limits. All positive and non-detect results for the listed samples below are qualified as estimated, "J" or "UJ".

<u>Element</u>	<u>Sample IDs</u>	<u>% recoveries</u>
Thallium	042SB00102	74
Thallium	GDASB00301	79
Thallium	GDASB00101	81

The post digestion spike recovery for GFAA was above the upper control limits. All positive results for the listed samples below are qualified as estimated, "J".

<u>Element</u>	<u>Sample IDs</u>	<u>% recoveries</u>
Selenium	042SB00102	121
Selenium	GDASB00101	121
Selenium	GDASB00202	125
Selenium	GDASB00201	117
Selenium	GDASB00302	115

Specific Finding

All sample results left with a "B" qualifier after all other qualifications, will be qualified with a "J" qualifier in place of the "B" per Ensafe's request.

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
all samples	K.	+ / U	J / UJ
042SB00102, GDASB00301 and 042SB00101.	Tl.	+ / U	J / UJ
042SB00102, GDASB00101, 202, 201 and 302.	Se.	+	J
All "B" results	all analytes	B	J



HEARTLAND

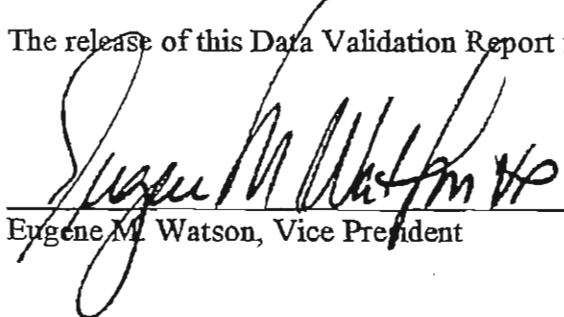
ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: L5552
Date: January 25, 1996
Client Name: Ensafé
Project/Site Name: Charleston Zone A
Date Sampled: October 6, 1995
Number of Samples: 7 Non-aqueous Sample(s) with 7 MS/MSD(s)
Laboratory: Lockheed Analytical Services
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, June 1991 and February, 1994, respectively
QA/QC Level: EPA DQO Level IV
Method(s) Utilized: SW846 Third Edition
Analytical Fractions: Volatiles, Semivolatiles, Pesticides/PCB's, Herbicides, Organophosphorus, Hexavalent Chromium, Metals, Cyanide

Analytical data in this report were screened to determine usability of results and also to determine contractual compliance relative to these requirements and deliverables. This screening assumes analytical results are correct as reported and merely provides an interpretation of the reported quality control results. A minimum of 10% of all laboratory calculations have been verified as part of this validation. All instrument output, i.e. spectra, chromatograms, etc., for each sample have been carefully reviewed. The end-user is urged to review the Specific Findings and associated Data Qualifications presented in this report. Annotated Form 1s or spreadsheets for all samples reviewed are included after the Data Assessment Narratives. Form 1s for MS/MSD samples or spreadsheets are not annotated.

The release of this Data Validation Report is authorized by the following signature:


Eugene M. Watson, Vice President


Date: 25 Jan 96

SDG# L5552

Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

ENSAFE ID	MATRIX	VOA	SVOA	P/P	HERB	OPP	HCR	TAL	CN
042CB00401	SOIL	X	X	X	X	X	X	X	X
042CB00902	SOIL	X	X	X		X	X	X	X
506CB00202	SOIL	X							
GDACB01101	SOIL		X						
507CB00401	SOIL			X					
002CB01301	SOIL				X				
002CB00701	SOIL					X			
Total Billable Samples (Water/Soil)		0	3	0	3	0	3	0	2

VOA = SW846 Volatiles

SV = SW846 Semivolatiles

P/P = SW846 Pesticide/PCB's

OPP = SW846 Organophosphorus Pesticides

HERB = SW846 Herbicides

HCR = SW846 Hexavalent Chromium

TAL = SW846 Metals

CN = SW846 Cyanide

DATA ASSESSMENT NARRATIVES

DATA ASSESSMENT NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8260; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5552

A validation was performed on the Volatile Data from SDG L5552. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibration
- Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Internal Standard Performance
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Initial Calibrations

The initial calibration analyzed exhibited non-compliant %RSDs and RRFs for compounds which required qualification of the data.

**DATA ASSESSMENT NARRATIVE
VOLATILE ANALYSIS**

PAGE - 2

Continuing Calibrations, continued

Specific Findings

The initial calibration, 10/18/95 on GCMS-I, contained compounds with %Ds greater than 25 % but less than 50%. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J.

042CB00902	2-butanone
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The initial calibration, 10/18/95 on GCMS-I, contained compounds with %Ds greater than 50 % but less than 90%. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J. and the non-detect results are qualified as estimated, UJ.

042CB00401	chloroethane
042CB00902	trichlorofluoromethane

The initial calibration, 10/18/95 on GCMS-I, contained compounds with RRFs less than 0.05. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J. and the non-detect results are rejected, R.

042CB00401	1,4-dioxane
042CB00902	

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 5 % of data required qualifications/rejections.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
042CB00902	2-butanone	+	J
042CB00401	chloroethane	+/-	J/UJ
042CB00902	trichlorofluoromethane		
042CB00401	1,4-dioxane	+/-	J/R
042CB00902			

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

SEMIVOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8270; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5552

A validation was performed on the Semivolatile Data from SDG L5552. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibration
- Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Internal Standard Performance
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Continuing Calibrations

The continuing calibration standard analyzed exhibited non-compliant %Ds for two (2) compounds which required qualification of the data.

**DATA ASSESSMENT NARRATIVE
SEMIVOLATILE ANALYSIS**

PAGE - 2

Continuing Calibrations, continued

Specific Findings

The continuing calibration standard, S0201002.D contained compounds with %Ds greater than 50% but less than 90%. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J, and the non-detect results are qualified as estimated, UJ.

042CB00402	methyl parathion
042CB00902	parathion

Method Blanks

TIC compounds were detected in the method blanks. All B flagged TICs are rejected, R.

System Performance and Overall Assessment

Overall performance was acceptable. The reviewer noted a contractual error. The laboratory analyzed an initial calibration curve using only four (4) calibration points for the part of the TCL instead of the method mandated five (5) points. The data reviewer estimates less than 5% of data required qualifications

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
042CB00402	methyl parathion	+/-	J/UJ
042CB00902	parathion		

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCLORS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8080; the National Functional Guidelines for Organic Data Validation, June 1991; and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5552

A validation was performed on the Pesticide/Aroclor Data from SDG L5552. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- * • Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Contractual Non-Compliance

The method requires that all target compounds, including the multi-component compounds, be analyzed with a five (5) point calibration curve. The laboratory analyzed a single point curve for the Aroclors 1221, 1232, 1242, 1248, and 1254, Toxaphene, and Chlordane. The data did not require qualification because no positive results were reported for the compounds analyzed with a single point calibration.

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCLOR ANALYSIS

PAGE - 2

Field Duplicates

The field duplicate pair of samples 042SB00401 and 042CB00401 exhibited positive results for one (1) compound.

Specific Finding

The field duplicate pair of samples 042SB00401 and 042CB00401 exhibited positive results for 4,4'-DDT. The calculated RPD was above the QC limit of 35%. The positive results for 4,4'-DDT are qualified as estimated, J.

042CB00401

4,4'-DDT

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 10% of the data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
042CB00401	4,4'-DDT	+	J

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE

CHLORINATED HERBICIDES

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8150; the National Functional Guidelines for Organic Data Validation, June 1991; and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5552

A validation was performed on the Herbicide Data from SDG L5552. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- * • Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 10% of the data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
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NO QUALIFICATIONS ARE REQUIRED.

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE

ORGANOPHOSPHORUS PESTICIDES

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8140; the National Functional Guidelines for Organic Data Validation, June 1991; and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5552

A validation was performed on the Organophosphorus Pesticide Data from SDG L5552. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Initial Calibrations

Several initial calibration standards associated with the reported samples exhibited correlation coefficients below the QC limit of 0.995.

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCLOL ANALYSIS

PAGE - 2

Initial Calibrations, Continued

Specific Findings

The initial calibration of 10/23/95 contained compounds with correlation coefficients less than 0.990 but greater than 0.850. For the samples and the non-compliant compounds listed below, the positive results are qualified as estimated, J, and the non-detect results are qualified as estimated, UJ.

042CB00401	Thionazin
042CB00902	Phorate
	Sulfotep

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 10% of the data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
042CB00401	Thionazin	+/-	J/UJ
042CB00902	Phorate		
	Sulfotep		

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE METALS

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the CLP ILM03.0 Method; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5552

A validation was performed on the Metals Data from SDG L5552. The data was evaluated based on the following parameters.

- * ● Data Completeness
- * ● Holding Times
- * ● Calibrations
- Blanks
- * ● Interferences
- * ● Matrix Spike Recovery
- * ● Matrix Duplicates
- * ● Field Duplicates
- * ● Laboratory Control Samples
- Serial Dilutions
- MSAs

* - All criteria were met for this parameter.

Preparation and Field Blanks

Specific Finding

The preparation blank exhibited contamination for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Iron	2.60 mg/kg	no impact
Zinc	0.69 mg/kg	no impact

The preparation blank exhibited negative bias for the following element.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Potassium	-147. mg/kg	all samples

The USEPA requires that the reviewer qualify data for negative bias when there is impact on the data. This reviewer qualifies all results below ten times the contamination as estimated, "J" or "UJ". The field or DI water blanks exhibited contamination but had no impact on the data.

Duplicate Analysis

Specific Finding

The Duplicate analyses were in control for all elements. All field duplicate RPDs were below 50%.

MSAs

Specific Finding

The post digestion spike recovery for GFAA was below the lower control limits. All positive and non-detect results for the listed samples below are qualified as estimated, "J" or "UJ".

<u>Element</u>	<u>Sample IDs</u>	<u>% recoveries</u>
Thallium	042CB00902.	77.

The post digestion spike recovery for GFAA was above the upper control limits. All positive results for the listed samples below are qualified as estimated, "J".

<u>Element</u>	<u>Sample IDs</u>	<u>% recoveries</u>
Selenium	042CB00902.	121.

Specific Finding

All sample results left with a "B" qualifier after all other qualifications, will be qualified with a "J" qualifier in place of the "B" per Ensafes request.

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
All samples	K.	+/U	J/UJ
042CB00902.	Se.	+/U	J/UJ
042CB00902.	Tl.	+	J
All "B" results	all analytes	B	J



HEARTLAND

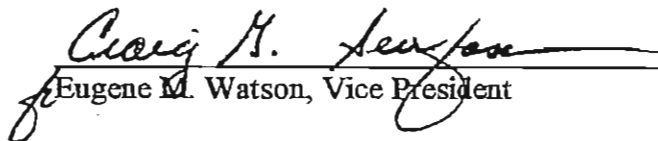
ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: 5554
Date: January 18, 1996
Client Name: Ensafe/Allen & Hoshall
Project/Site Name: Charleston Zone A
Date Sampled: October 6, 1995
Number of Samples: 22 Non-aqueous Sample(s) with 3 MS/MSD(s)
Laboratory: Lockheed Analytical Services
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, June 1991 and February, 1994, respectively
QA/QC Level: EPA DQO Level III
Method(s) Utilized: SW846 Third Edition
Analytical Fractions: Volatiles, Semivolatiles, Pesticides/PCB's, Herbicides, Metals, Cyanide

Analytical data in this report were screened to determine usability of results and also to determine contractual compliance relative to these requirements and deliverables. This screening assumes analytical results are correct as reported and merely provides an interpretation of the reported quality control results. A minimum of 10% of all laboratory calculations have been verified as part of this validation. All instrument output, i.e. spectra, chromatograms, etc., for each sample have been carefully reviewed. The end-user is urged to review the Specific Findings and associated Data Qualifications presented in this report. Annotated Form 1s or spreadsheets for all samples reviewed are included after the Data Assessment Narratives. Form 1s for MS/MSD samples or spreadsheets are not annotated.

The release of this Data Validation Report is authorized by the following signature:


Eugene M. Watson, Vice President

1-19-96
Date

SDG# 5554

Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

ENSAFE ID	MATRIX	VOA		SVOA		P/P		HERB		TAL		CN	
042-S-B002-01	SOIL		X		X		X		X		X		X
042-S-B002-02	SOIL		X		X		X		X		X		X
042-S-B003-01	SOIL		X		X		X		X		X		X
042-S-B003-02	SOIL		X		X		X		X		X		X
042-T-B003-02	SOIL		X										
042-S-B004-01	SOIL		X		X		X		X		X		X
042-S-B004-02	SOIL		X		X		X		X		X		X
042-S-B005-01	SOIL		X		X		X		X		X		X
042-S-B005-02	SOIL		X		X		X		X		X		X
042-S-B006-01	SOIL		X		X		X		X		X		X
042-S-B006-02	SOIL		X		X		X		X		X		X
042-S-B007-01	SOIL		X		X		X		X		X		X
042-S-B007-02	SOIL		X		X		X		X		X		X
042-S-B008-01	SOIL		X		X		X		X		X		X
042-S-B008-02	SOIL		X		X		X		X		X		X
042-S-B009-01	SOIL		X		X		X		X		X		X
042-S-B009-02	SOIL		X		X		X		X		X		X
505-S-B001-01	SOIL		X		X		X		X		X		X
505-S-B001-02	SOIL		X		X		X		X		X		X
505-S-B004-01	SOIL		X		X		X		X		X		X
505-S-B004-02	SOIL		X		X		X		X		X		X
GDA-S-B003-01	SOIL		X										
Total Billable Samples (Water/Soil)		0	22	0	20	0	20	0	20	0	20	0	20

VOA= SW846 Volatiles

SV= SW846 Semivolatiles

P/P= SW846 Pesticide/PCB's

HERB= SW846 Herbicides

TAL= SW846 Metals

CN= SW846 Cyanide

DATA ASSESSMENT NARRATIVES

DATA ASSESSMENT NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8260; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5554

A validation was performed on the Volatile Data from SDG L5554. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Internal Standard Performance
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Continuing Calibrations

The continuing calibrations analyzed exhibited non-compliant %Ds for compounds which required qualification of the data.

**DATA ASSESSMENT NARRATIVE
VOLATILE ANALYSIS**

PAGE - 2

Continuing Calibrations, continued

Specific Findings

The continuing calibration, J3978, contained compounds with %Ds greater than 50% but less than 90%. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J. and the non-detect results are qualified as estimated, UJ.

042SB00201	trichlorofluoromethane
042SB00202	
042SB00601	

The continuing calibration, J4015, contained compounds with %Ds greater than 50% but less than 90%. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J. and the non-detect results are qualified as estimated, UJ.

505SB00101	trichlorofluoromethane
505SB00102	
042SB00301	
042SB00302	

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 5% of data required qualifications/rejections.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
042SB00201	trichlorofluoromethane	+/-	J/UJ
042SB00202			
042SB00601			
505SB00101	trichlorofluoromethane	+/-	J/UJ
505SB00102			
042SB00301			
042SB00302			

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

SEMIVOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8270; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5554

A validation was performed on the Semivolatile Data from SDG L5554. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibration
- Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Internal Standard Performance
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Continuing Calibrations

One (1) of the continuing calibration standards analyzed exhibited a non-compliant %D for one (1) compound which required qualification of the data.

**DATA ASSESSMENT NARRATIVE
SEMIVOLATILE ANALYSIS**

PAGE - 2

Continuing Calibrations, continued

Specific Findings

The continuing calibration standard, S0201002.D contained compounds with %Ds greater than 90%. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J, and the non-detect results are rejected, R.

042SB00802	benzoic acid
------------	--------------

Method Blanks

TICs were detected in the method blanks. All B flagged TICs are rejected.

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 5% of data required qualifications

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
042SB00802	benzoic acid	+/-	J/R

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCLORS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8080; the National Functional Guidelines for Organic Data Validation, June 1991; and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5554

A validation was performed on the Pesticide/Aroclor Data from SDG L5554. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- * • Calibration
- * • Blanks
- Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Surrogate Recoveries

Several field samples exhibited non-compliant DCB recoveries.

DATA ASSESSMENT NARRATIVE
PESTICIDE/AROCLOR ANALYSIS

PAGE - 2

Surrogate Recoveries, Continued

Specific Finding

The sample listed below exhibited a high DCB recovery. The positive results are qualified as estimated, J.

505SB00401

The sample listed below exhibited a low DCB recovery. The positive results are qualified as estimated, J, and the non-detect results are qualified as estimated, UJ.

042SB00802

Field Duplicates

The field duplicate pair of samples 042SB00401 and 042CB00401 exhibited positive results for One (1) compound.

Specific Finding

The field duplicate pair of samples 042SB00401 and 042CB00401 exhibited positive results for 4,4'-DDT. The calculated RPD was above the QC limit of 35 %. The positive results for 4,4'-DDT are qualified as estimated, J.

042SB00401

4,4'-DDT

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 10% of the data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
505SB00401	ALL	+	J
042SB00802	ALL	+/-	J/UJ
042SB00401	4,4'-DDT	+	J

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE METALS

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the CLP ILM03.0 Method; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5554

A validation was performed on the Metals Data from SDG L5554. The data was evaluated based on the following parameters.

- * ● Data Completeness
- * ● Holding Times
- * ● Calibrations
- Blanks
- * ● Interferences
- Matrix Spike Recovery
- Matrix Duplicates
- * ● Field Duplicates
- * ● Laboratory Control Samples
- Serial Dilutions
- MSAs

* - All criteria were met for this parameter.

Preparation and Field Blanks

Specific Finding

The preparation blank exhibited contamination for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Antimony	11.3 mg/kg	no impact
Iron	2.48 mg/kg	no impact

The USEPA requires that all sample values below five times the preparation, field, DI or calibration blank contamination be qualified as estimated, "U". The field or DI water blanks exhibited contamination but had no impact on the data.

Matrix Spike Analysis

Specific Finding

The Matrix Spike analysis for Cadmium was below the lower control limits. All positive and non-detect results for all soil samples are qualified as estimated, "J" or "UJ".

Duplicate Analysis

Specific Finding

The Duplicate analysis for Lead was outside the control limits. All positive results for all soil samples are qualified as estimated, "J".

Serial Dilution Analysis

Specific Finding

The Serial Dilution analysis for Calcium was outside the control limits. All positive results for all soil samples are qualified as estimated, "J".

MSAs

Specific Finding

The post digestion spike recovery for GFAA was above the upper control limits. All positive results for the listed samples below are qualified as estimated, "J".

<u>Element</u>	<u>Sample IDs</u>	<u>% recoveries</u>
Arsenic	042SB00202	119
Selenium	042SB00802	121
Selenium	042SB00902	123
Selenium	505SB00101	116
Selenium	042SB00602	118
Selenium	505SB00402	117
Selenium	042SB00301	116
Selenium	042SB00502	121

Specific Finding

All sample results left with a "B" qualifier after all other qualifications, will be qualified with a "J" qualifier in place of the "B" per Ensafe's request.

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
All soil samples	Cd.	+ / U	J / UJ
All soil samples	Pb.	+	J
All soil samples	Ca.	+	J
042SB00202.	As.	+	J
042SB00802, 902, 602, 301 and 502, 505SB00101 and 402.	Se.		
All "B" results	all analytes	B	J



HEARTLAND

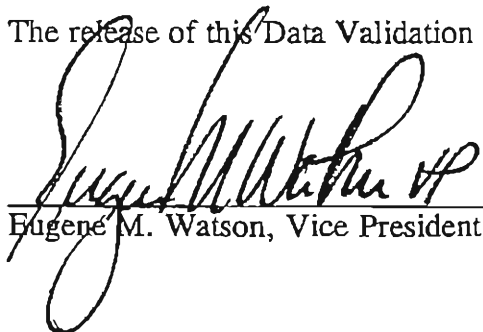
ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: L5557
Date: January 26, 1996
Client Name: Ensafe
Project/Site Name: Charleston Zone A
Date Sampled: October 9, 1995
Number of Samples: 7 Non-aqueous Sample(s) with 5 MS/MSD(s)
Laboratory: Lockheed Analytical Services
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, June 1991 and February, 1994, respectively
QA/QC Level: EPA DQO Level III
Method(s) Utilized: CLP Multimedia SOW
Analytical Fractions: Volatiles, Semivolatiles, Pesticides/PCB's, Organophosphorus Pesticides, Herbicides, Hexavalent Chromium, Metals, Cyanide

Analytical data in this report were screened to determine usability of results and also to determine contractual compliance relative to these requirements and deliverables. This screening assumes analytical results are correct as reported and merely provides an interpretation of the reported quality control results. A minimum of 10% of all laboratory calculations have been verified as part of this validation. All instrument output, i.e. spectra, chromatograms, etc., for each sample have been carefully reviewed. The end-user is urged to review the Specific Findings and associated Data Qualifications presented in this report. Annotated Form 1s or spreadsheets for all samples reviewed are included after the Data Assessment Narratives. Form 1s for MS/MSD samples or spreadsheets are not annotated.

The release of this Data Validation Report is authorized by the following signature:


Eugene M. Watson, Vice President


Date

SDG# 15557

Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

Ensafe ID	Matrix	VOA	SV	P/P	OPP	HERB	HCR	TAL	CN
506CB00202	SOIL	X							
GDACB00501	SOIL	X	X	X	X	X	X	X	X
GDACB00701	SOIL	X	X	X	X	X	X	X	X
GDACB01101	SOIL	X	X	X	X	X	X	X	X
507CB00499	SOIL			X					
002CB00701	SOIL				X				
002CB01301	SOIL					X			
Total Billable Samples (Water/Soil)		0	4	0	3	0	4	0	3

VOA = CLP Volatiles
 P/P = CLP Pesticide/PCB's
 OPP = CLP Organophosphorus Pesticides
 HERB = CLP Herbicides
 HCR = CLP Hexavalent Chromium
 TAL = CLP Metals w/cyanide
 CN = CLP Cyanide

DATA ASSESSMENT NARRATIVES

DATA ASSESSMENT AND NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA SW846, Method 8260 Appendix IX; the National Functional Guidelines for Organic Data Review, June 1991, and DQO Level IV. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualifications table.

SDG # L5557

A validation was performed on the Volatile Data from SDG L5557. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibrations
- Internal Standard Performance
- Blanks
- Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- Compound Identification /Quantitation

* - All criteria were met for this parameter

Initial Calibrations

The initial calibrations that were analyzed by the laboratory for these samples were not acceptable for all compound %RSDs and the average RRFs for all of the compounds did not meet the initial calibration criteria.

DATA ASSESSMENT AND NARRATIVE

VOLATILE ANALYSIS

PAGE - 2

Initial calibrations (continued)

Specific Finding:

1. The initial calibration analyzed on, 10/18/95, contained compounds with RRFs less than 0.05. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and reject all non detects (R).

28878MB	1,4-dioxane
GDACB00701	
GDACB00501	
GDACB01101	

Continuing calibrations

The continuing calibrations that were analyzed with this data package exhibited %Ds that were not within %D continuing calibration criteria. All RRFs were within calibration criteria.

Specific Finding:

The continuing calibration, E2359, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

GDACB00701RE	acetone
	2-butanone

The continuing calibration, E2359, contained compounds with RRFs less than 0.05. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and reject all non detects (R).

GDACB00701RE	isobutanol
	1,4-dioxane

DATA ASSESSMENT AND NARRATIVE

VOLATILE ANALYSIS

PAGE - 3

Internal Standards

All internal standard EICP areas did not meet the internal standard EICP area QA/QC criteria.

Specific Finding:

The Samples listed below, exhibited low internal standard areas. Qualify all associated positive results as estimated (J) and all non detects as estimated (UJ).

GDACB00701	1,4-dichlorobenzene-d ₄
GDACB00501	
GDACB00701RE	pentafluorobenzene
	1,4-difluorobenzene
	chlorobenzene-d ₅
	1,4-dichlorobenzene-d ₄

Method Blanks

<u>Associated blank</u>	<u>Compound</u>	<u>Concentration</u>
28916MB	methylene chloride	1.2J
<u>Samples</u>	<u>Compound</u>	<u>Qualification</u>
GDACB00701RE	methylene chloride	CRQL

Surrogates

All of the surrogate recoveries for the all blanks and samples were not within QA/QC limits.

Specific Finding:

The samples listed below, exhibited low surrogate recoveries for bromofluorobenzene. Qualify all positive results as estimated (J) and all non detects as estimated (UJ).

GDACB00701
GDACB00701RE

DATA ASSESSMENT AND NARRATIVE

VOLATILE ANALYSIS

PAGE - 4

Compound Identification/Quantitation

Specific Finding:

Reject all results for the sample GDACB00701RE, due to non compliant internal standard areas.

System Performance and Overall Assessment

The overall system performance was fair. The laboratory did not encounter any large problems. The data reviewer estimates that less than 5% of the data is qualified.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

NJ = Presumptive evidence for the presence of the material at an estimated value

K = Result is biased high

L = Result is biased low

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
28878MB GDACB00701 GDACB00501 GDACB01101	1,4-dioxane	+/-	J/R
GDACB00701RE	acetone 2-butanone	+/-	J/UJ
GDACB00701RE	isobutanol 1,4-dioxane	+/-	J/R
GDACB00701 GDACB00501	All associated analytes 1,4-dichlorobenzene-d ₄	+/-	J/UJ
GDACB00701RE	pentafluorobenzene 1,4-difluorobenzene chlorobenzene-d ₅ 1,4-dichlorobenzene-d ₄		
GDACB00701RE	methylene chloride	+	CRQL
GDACB00701 GDACB00701RE	All analytes	+/-	J/UJ
GDACB00701RE	All analytes	+/-	R

* DL denotes the Form I qualifier supplied by the laboratory
 QL denotes the qualifier used by the data validation firm
 + in the DL column denotes a positive result
 - in the DL column denotes a non detect result

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA SW846, Method 8270 Appendix IX; National Functional Guidelines for Organic Data Review, and DQO Level IV. All comments made within this report should be considered when examining the analytical results (Form I's).

SDG # L5557

A validation was performed on the Semivolatile Data from SDG L5557. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibrations
- * • Internal Standard Performance
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- * • Compound Identification /Quantitation

* - All criteria were met for this parameter

Continuing calibrations

The continuing calibrations that were analyzed with this data package exhibited %Ds that were not within %D continuing calibration criteria. All RRFs were within calibration criteria.

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ANALYSIS

PAGE - 2

Continuing calibrations (continued)

Specific Finding:

The continuing calibration, S0201002/301003, contained compounds with %Ds greater than 50 %, but less than 90 %. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

GDACB01101	methyl parathion
	parathion

The continuing calibration, S0201002/301003, contained compounds with %Ds greater than 50 %, but less than 90 %. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

GDACB00501	1,3,5-trinitrobenzene
GDACB00701	

The continuing calibration, S0201002/301003, contained compounds with %Ds greater than 90 %. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and reject all non detects (R).

GDACB00501	methyl parathion
GDACB00701	parathion

System Performance and Overall Assessment

The overall system performance was fair. The data package exhibited a contractual non compliances. The laboratory reported in the case narrative that the 120 ng std for one of the initial calibration was outside of calibration criteria, therefore, only a four point calibration was used. Method 8270 requires a minimum of a five point calibration for all compounds page 8270-11, section 5.4. The data reviewer estimates that less than 5 % of the data is qualified.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

NJ = Presumptive evidence for the presence of the material at an estimated value

K = Result is biased high

L = Result is biased low

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
GDACB01101	methyl parathion parathion	+/-	J/UJ
GDACB00501 GDACB00701	1,3,5-trinitrobenzene	+/-	J/UJ
GDACB00501 GDACB00701	methyl parathion parathion	+/-	J/R

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

**DATA ASSESSMENT NARRATIVE
CHLORINATED PESTICIDES**

PAGE - 3

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates that 5 % of data required qualifications/rejections.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
GDACB00501 GDACB01101	4,4'-DDT	+	J
GDACB00501 GDACB01101	aldrin β-BHC δ-BHC Heptachlor epoxide γ-chlordane α-chlordane 4,4'-DDE Endosulfan II Endrin aldehyde Endosulfan sulfate Endrin ketone Kepone	+/-	J/UJ
GDACB01101	4,4'-DDT	+	J

- * DL denotes the Form I qualifier supplied by the laboratory
 QL denotes the qualifier used by the data validation firm
 + in the DL column denotes a positive result
 - in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

ORGANOPHOSPHORUS PESTICIDES

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8140; the National Functional Guidelines for Organic Data Validation, June 1991; and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5557

A validation was performed on the Organophosphorus Pesticide Data from SDG L5557. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- * • Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 10% of the data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
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NO QUALIFICATIONS ARE REQUIRED.

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE

CHLORINATED HERBICIDES

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8150; the National Functional Guidelines for Organic Data Validation, June 1991; and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5557

A validation was performed on the Herbicide Data from SDG L5557. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- * • Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 10% of the data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
------------------	-------------------	-----------	-----------

NO QUALIFICATIONS ARE REQUIRED.

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE METALS, CYANIDE AND HEX CR.

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the CLP ILM03.0 Method; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5557

A validation was performed on the Metals and Cyanide Data from SDG L5557. The data was evaluated based on the following parameters.

- * ● Data Completeness
- * ● Holding Times
- * ● Calibrations
- Blanks
- * ● Interferences
- Matrix Spike Recovery
- * ● Matrix Duplicates
- * ● Field Duplicates
- * ● Laboratory Control Samples
- Serial Dilutions
- MSAs

* - All criteria were met for this parameter.

Preparation and Field Blanks

Specific Finding

The preparation blank exhibited contamination for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Iron	2.43 mg/kg	no impact
Zinc	0.90 mg/kg	no impact

The USEPA requires that all sample values below five times the preparation, field, DI or calibration blank contamination be qualified as non-detect, "U". The field or DI water blanks exhibited contamination but had no impact on the data.

Matrix Spike Analysis

Specific Finding

The Matrix Spike analysis for Antimony for soils was below the lower control limits. All positive and non-detect results for all soil samples are qualified as estimated, "J" or "UJ".

Duplicate Analysis

Specific Finding

The field duplicate and laboratory duplicate RPDs were within the 50% criteria.

MSAs

Specific Finding

The post digestion spike recovery for GFAA was below the lower control limits. All positive and non-detect results for the listed samples below are qualified as estimated, "J" or "UJ".

<u>Element</u>	<u>Sample IDs</u>	<u>% recoveries</u>
Arsenic	GDACB00501	84
Selenium	GDACB01101	78
Selenium	GDACB00701	83

Specific Finding

All sample results left with a "B" qualifier after all other qualifications, will be qualified with a "J" qualifier in place of the "B" per Ensafe's request.

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
All soil samples	Sb.	+/U	J/UJ
GDACB00501.	As.	+/U	J/UJ
GDACB01101 and 00701.	Se.		
All "B" results	all analytes	B	J



HEARTLAND

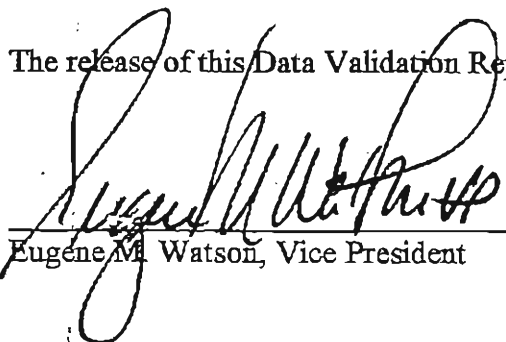
ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: L5563
Date: January 26, 1996
Client Name: Ensafe, Inc.
Project/Site Name: Charleston Zone A
Date Sampled: October 7-9, 1995
Number of Samples: 48 Non-aqueous Sample(s) with 4 MS/MSD(s)
Laboratory: Lockheed Analytical Services
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, June 1991 and February, 1994, respectively
QA/QC Level: EPA DQO Level III
Method(s) Utilized: SW846 Third Edition
Analytical Fractions: Volatiles, Semivolatiles, Pesticide/PCB's, Herbicides, pH, Metals, and Cyanide

Analytical data in this report were screened to determine usability of results and also to determine contractual compliance relative to these requirements and deliverables. This screening assumes analytical results are correct as reported and merely provides an interpretation of the reported quality control results. A minimum of 10% of all laboratory calculations have been verified as part of this validation. All instrument output, i.e. spectra, chromatograms, etc., for each sample have been carefully reviewed. The end-user is urged to review the Specific Findings and associated Data Qualifications presented in this report. Annotated Form 1s or spreadsheets for all samples reviewed are included after the Data Assessment Narratives. Form 1s for MS/MSD samples or spreadsheets are not annotated.

The release of this Data Validation Report is authorized by the following signature:



Eugene M. Watson, Vice President



Date

SDG# L5563

Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

ENSAFE ID	MATRIX	VOA	SVOA	P/P	HERB	PH	TAL	CN							
001SB00101	SOIL	X	X												
042SB01001	SOIL	X	X	X	X		X	X							
043SB00101	SOIL	X	X			X	X								
043SB000102	SOIL	X	X			X	X								
043SB00201	SOIL	X	X			X	X								
043SB00301	SOIL	X	X			X	X								
043TB00301	SOIL	X	X												
043SB00401	SOIL	X	X			X	X								
043SB00402	SOIL	X	X			X	X								
043SB00501	SOIL	X	X			X	X								
043SB00502	SOIL	X	X			X	X								
043SB00601	SOIL	X	X			X	X								
043SB00602	SOIL	X	X			X	X								
505SB00201	SOIL	X	X	X	X		X	X							
505SB00301	SOIL	X	X	X	X		X	X							
505SB00302	SOIL	X	X	X	X		X	X							
505SB00501	SOIL	X	X	X	X		X	X							
505SB00502	SOIL	X	X	X	X		X	X							
505SB00601	SOIL	X	X	X	X		X	X							
505SB00701	SOIL	X	X	X	X		X	X							
505SB00702	SOIL	X	X	X	X		X	X							
505SB00801	SOIL	X	X	X	X		X	X							
505SB00802	SOIL	X	X	X	X		X	X							
505SB00901	SOIL	X	X	X	X		X	X							
505SB01001	SOIL	X	X	X	X		X	X							
505SB1002	SOIL	X	X	X	X		X	X							
505SB01101	SOIL	X	X	X	X		X	X							
505SB01102	SOIL	X	X	X	X		X	X							
GDASB00501	SOIL	X	X	X			X	X							
GDASB00502	SOIL	X	X	X			X	X							
GDASB00601	SOIL	X	X	X			X	X							
GDASB00602	SOIL	X	X	X			X	X							
GDASB00701	SOIL	X	X	X			X	X							
GDASB00702	SOIL	X	X	X			X	X							
GDASB00801	SOIL	X	X	X			X	X							
GDASB00802	SOIL	X	X	X			X	X							
GDASB00901	SOIL	X	X	X			X	X							
GDASB00902	SOIL	X	X	X			X	X							
GDASB01001	SOIL	X	X	X			X	X							
GDASB01101	SOIL	X	X	X			X	X							
GDASB01102	SOIL	X	X	X			X	X							
GDASB01201	SOIL	X	X	X			X	X							
GDASB01202	SOIL	X	X	X			X	X							
GDASB01301	SOIL	X	X	X			X	X							
GDASB01302	SOIL	X	X	X			X	X							
507CB00498	SOIL			X											
002SB02801	SOIL						X								
002SB02901	SOIL						X								
Total Billable Samples (Water/Soil)		0	45	0	45	0	34	0	16	0	10	0	45	0	33

VOA= SW846 Volatiles

SV= SW846 Semivolatiles

P/P SW846 Pesticide/PCB

HERB= SW846 Herbicides

TAL= SW846 Metals

CN= SW846 Cyanide

PH= pH

DATA ASSESSMENT NARRATIVES

DATA ASSESSMENT AND NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA SW846, Method 8260 Appendix IX; the National Functional Guidelines for Organic Data Review, June 1991, and DQO Level III. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualifications table.

SDG # L5563

A validation was performed on the Volatile Data from SDG L5563. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibrations
- Internal Standard Performance
- Blanks
- Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- Compound Identification /Quantitation

* - All criteria were met for this parameter

Continuing calibrations

The continuing calibrations that were analyzed with this data package exhibited %Ds that were not within %D continuing calibration criteria. All RRFs were within calibration criteria.

**DATA ASSESSMENT AND NARRATIVE
VOLATILE ANALYSIS**

PAGE - 2

Continuing calibrations (continued)

Specific Finding:

The continuing calibration, C0238, contained compounds with %Ds greater than 25 %but less than 50%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J).

505SB00702 acetone
505SB00802

The continuing calibration, C0256, contained compounds with %Ds greater than 25 %but less than 50%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J).

505SB00702RE 2-butanone

The continuing calibration, C0329, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

043SB00102DL1 chloroethane

The continuing calibration, J4085, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

GDASB01201 trichlorofluoromethane
043SB00402
043SB00502DL
GDASB01102

The continuing calibration, J4085, contained compounds with %Ds greater than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and reject all non detects (R).

GDASB01201 chloroethane
043SB00402
043SB00502DL
GDASB01102

**DATA ASSESSMENT AND NARRATIVE
VOLATILE ANALYSIS**

PAGE - 3

Internal Standards

All internal standard EICP areas did not meet the internal standard EICP area QA/QC criteria.

Specific Finding:

The Samples listed below, exhibited low internal standard areas. Qualify all associated positive results as estimated (J) and all non detects as estimated (UJ).

043SB00102	pentafluorobenzene
043SB00102DL	1,4-difluorobenzene
GDASB01102RE	chlorobenzene-d ₅
GDASB01102	1,4-dichlorobenzene-d ₄

043SB00301	1,4-dichlorobenzene-d ₄
043SB00601	
043SB00301MS	
043SB00301MSD	
505SB00501RE	
505SB00702RE	

043SB00102	chlorobenzene-d ₅
043SB00601	1,4-dichlorobenzene-d ₄
043SB00502	

Method Blanks

<u>Associated blank</u>	<u>Compound</u>	<u>Concentration</u>
29030MB	methylene chloride	1.3J
29044MB	acetone	8.1
	2-butanone	1.6
	2-hexanone	1.3
29228	2-hexanone	1.2

**DATA ASSESSMENT AND NARRATIVE
VOLATILE ANALYSIS**

PAGE - 4

Method Blanks (continued)

<u>Samples</u>	<u>Compound</u>	<u>Qualification</u>
GDASB01102	methylene chloride	CRQL
505SB01002	acetone	U
043SB00602		
043SB00301		
043SB00602	2-butanone	CRQL

Trip Blanks

<u>Associated blank</u>	<u>Compound</u>	<u>Concentration</u>
043TB00301	methylene chloride	1.1J ug/L
	chloroform	4.7J ug/L

<u>Samples</u>	<u>Compound</u>	<u>Qualification</u>
042SB01001	methylene chloride	CRQL
043SB00101		
043SB00201		
043SB00602		
505SB00801		
505SB00901		
505SB01002		
505SB01101		
505SB01202		
GDASB01102		
GDASB01302		
043SB00301	methylene chloride	U
043SB00601RE		

**DATA ASSESSMENT AND NARRATIVE
VOLATILE ANALYSIS**

PAGE - 5

Surrogates

All of the surrogate recoveries for the all blanks and samples were not within QA/QC limits.

Specific Finding:

The samples listed below, exhibited low surrogate recoveries for bromofluorobenzene. Qualify all positive results as estimated (J) and all non detects as estimated (UJ).

GDASB01102
505SB00501
505SB00501RE
505SB00601
505SB00601RE
505SB00702
505SB00702RE
505SB00301
505SB00301RE
043SB00601
043SB00102
043SB00102DL
043SB00301

Compound Identification/Quantitation

Specific Finding:

For samples 043SB00102 and 043SB00502, reject all E-flagged results in favor of the D-flagged results in the diluted sample. For the diluted samples 043SB00102 and 043SB00502, reject all results (UR) except for the D-flagged results with corresponding E-flagged results.

Reject all results for the re-analyzed samples listed below, in favor of the original sample analysis due to non compliant internal standard areas and/or surrogate recoveries.

505SB00501RE
505SB00601RE
505SB00702RE
505SB00301RE
GDASB01102RE

**DATA ASSESSMENT AND NARRATIVE
VOLATILE ANALYSIS**

PAGE - 6

System Performance and Overall Assessment

The overall system performance was fair. The laboratory did not encounter any large problems. The data reviewer estimates that less than 5% of the data is qualified.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

NJ = Presumptive evidence for the presence of the material at an estimated value

K = Result is biased high

L = Result is biased low

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
505SB00702 505SB00802	acetone	+	J
505SB00702RE	2-butanone	+	J
043SB00102DL1	chloroethane	+/-	J/UJ
GDASB01201 043SB00402 043SB00502DL GDASB01102	trichlorofluoromethane	+/-	J/UJ
GDASB01201 043SB00402 043SB00502DL GDASB01102	chloroethane	+/-	J/R
043SB00102 043SB00102DL GDASB01102RE GDASB01102	All associated analytes pentafluorobenzene 1,4-difluorobenzene chlorobenzene-d ₅ 1,4-dichlorobenzene-d ₄	+/-	J/UJ
043SB00301 043SB00601 043SB00301MS 043SB00301MSD 505SB00501RE 505SB00702RE	1,4-dichlorobenzene-d ₄		
043SB00102DL1 043SB00601RE 043SB00502	chlorobenzene-d ₅ 1,4-dichlorobenzene-d ₄		

- * DL denotes the Form I qualifier supplied by the laboratory
 QL denotes the qualifier used by the data validation firm
 + in the DL column denotes a positive result
 - in the DL column denotes a non detect result

SUMMARY OF DATA QUALIFICATIONS

Page - 2

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
GDASB01102	methylene chloride	+	CRQL
505SB01002	acetone	+	U
043SB00602			
043SB00301			
043SB00602	2-butanone	+	CRQL
042SB01001	methylene chloride	+	CRQL
043SB00101			
043SB00201			
043SB00602			
505SB00801			
505SB00901			
505SB01002			
505SB01101			
505SB01202			
GDASB01102			
GDASB01302			
043SB00301	methylene chloride	+	U
043SB00601RE			

* DL denotes the Form I qualifier supplied by the laboratory
 QL denotes the qualifier used by the data validation firm
 + in the DL column denotes a positive result
 - in the DL column denotes a non detect result

SUMMARY OF DATA QUALIFICATIONS

Page - 3

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
GDASB01102	All analytes	+/-	J/UJ
505SB00501			
505SB00501RE			
505SB00601			
505SB00601RE			
505SB00702			
505SB00702RE			
505SB00301			
505SB00301RE			
043SB00601			
043SB00102			
043SB00102DL			
043SB00301			
043SB00102	All E-flagged results	+	R
043SB00502			
043SB00102DL	All results except D-flagged results	+/-	R
043SB00502DL			
505SB00501RE	All analytes	+/-	R
505SB00601RE			
505SB00702RE			
505SB00301RE			
GDASB01102RE			

- * DL denotes the Form I qualifier supplied by the laboratory
 QL denotes the qualifier used by the data validation firm
 + in the DL column denotes a positive result
 - in the DL column denotes a non detect result

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA SW846, Method 8270 Appendix IX; National Functional Guidelines for Organic Data Review, and DQO Level III. All comments made within this report should be considered when examining the analytical results (Form I's).

SDG # L5563

A validation was performed on the Semivolatile Data from SDG L5563. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibrations
- * • Internal Standard Performance
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- * • Compound Identification /Quantitation

* - All criteria were met for this parameter

Continuing calibrations

The continuing calibrations that were analyzed with this data package exhibited %Ds that were not within %D continuing calibration criteria. All RRFs were within calibration criteria.

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ANALYSIS

PAGE - 2

Continuing calibrations (continued)

Specific Finding:

The continuing calibration, S0201002, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

505SB00502	bis(2-chloroisopropyl)ether	-	=	.
505SB00501				
505SB00601				

The continuing calibration, S0201002, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

GDASB00702	benzoic acid
GDASB00602	
GDASB00802	
GDASB01202	
043SB00501	
043SB00401	
043SB00402	
043SB00502	
GDASB01302	

System Performance and Overall Assessment

The overall system performance was fair. The laboratory did not encounter any large problems. The data reviewer estimates that less than 5% of the data is qualified.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

NJ = Presumptive evidence for the presence of the material at an estimated value

K = Result is biased high

L = Result is biased low

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
505SB00502 505SB00501 505SB00601	bis(2-chloroisopropyl)ether	+/-	J/UJ
GDASB00702 GDASB00602 GDASB00802 GDASB01202 043SB00501 043SB00401 043SB00402 043SB00502 GDASB01302	benzoic acid	+/-	J/UJ

- * DL denotes the Form I qualifier supplied by the laboratory
 QL denotes the qualifier used by the data validation firm
 + in the DL column denotes a positive result
 - in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

CHLORINATED PESTICIDES

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8080; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5563

A validation was performed on the Chlorinated Pesticide Data from SDG L5563. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- Calibration
- * • Blanks
- Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- Compound Quantitation

* - All criteria were met for this parameter.

Continuing Calibrations

The continuing calibrations that were analyzed by the laboratory for these samples were not acceptable for all compound %Ds.

**DATA ASSESSMENT NARRATIVE
CHLORINATED PESTICIDES**

PAGE - 2

Continuing Calibrations, continued

Specific Findings

The continuing calibrations on 11/04/95, at 0242/0324/0407, contained compounds with %Ds greater than 15 % but less than 50 %. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J.

GDASB00902 4,4'-DDT

GDASB00601 4,4'-DDE

GDASB01001

The continuing calibrations on 11/04/95, at 0242/0324/0407, contained compounds with %Ds greater than 50 % but less than 90 %. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J, and the non-detect results are qualified as estimated, UJ.

GDASB00902	aldrin
GDASB00601	β -BHC
GDASB01001	δ -BHC
	Heptachlor epoxide
	γ -chlordane
	α -chlordane
	4,4'-DDE
	Endosulfan II
	Endrin aldehyde
	Endosulfan sulfate
	Endrin ketone
	Kepone

Surrogate Recoveries

Five (5) samples required qualifications based on non-compliant surrogate recoveries. See the specific findings on the following page.

**DATA ASSESSMENT NARRATIVE
CHLORINATED PESTICIDES**

PAGE - 3

Surrogate Recoveries, continued

Specific Findings

The following samples exhibited a surrogate recovery below the QC limits. All positive and non-detect results in the following samples are qualified as estimated, J/UJ.

GDASB00601
GDASB01001
505SB00201

The following samples exhibited a surrogate recovery above the QC limits. All positive results in the following samples are qualified as estimated, J.

GDASB00801
GDASB01301

Compound Quantitation

The following samples required dilutions to accurately quantitate some of the detected target compounds. For the following samples, the E flagged results are rejected, R, in favor of the results reported from the dilution analysis. All other results from the dilution analyses are rejected, UR.

GDASB00901
042SB01001
505SB00301
GDASB01201

The positive results for the noted compounds in the following samples are qualified as estimated, J, because the concentration is above the calibration range.

042SB01001

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates that 5% of data required qualifications/rejections.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
GDASB00902	4,4'-DDT	+	J
GDASB00601	4,4'-DDE	+	J
GDASB01001			
GDASB00902	aldrin	+	J/UJ
GDASB00601	β -BHC		
GDASB01001	δ -BHC		
	Heptachlor epoxide		
	γ -chlordane		
	α -chlordane		
	4,4'-DDE		
	Endosulfan II		
	Endrin aldehyde		
	Endosulfan sulfate		
	Endrin ketone		
	Kepone		
GDASB00601	All Compounds	+/-	J/UJ
GDASB01001			
505SB00201			
GDASB00801	All Compounds	+	J
GDASB01301			
GDASB00901	All E Flagged	+	R
042SB01001			
505SB00301			
GDASB01201			
GDASB00901DL	All except D Flagged	+	R
042SB01001DL			
505SB00301DL			
GDASB01201DL			
042SB01001	All E flagged	+	J

SUMMARY OF DATA QUALIFICATIONS

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

CHLORINATED HERBICIDES

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8150; the National Functional Guidelines for Organic Data Validation, June 1991; and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5563

A validation was performed on the Herbicide Data from SDG L5563. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Initial Calibrations

One (1) initial calibration standard associated with the reported samples exhibited correlation coefficient below the QC limit of 0.995.

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCLOL ANALYSIS

PAGE - 2

Initial Calibrations, Continued

Specific Findings

The initial calibration of 10/27/95 contained a compound with a correlation coefficient less than 0.990 but greater than 0.850. For the samples and the non-compliant compound listed below, the positive results are qualified as estimated, J, and the non-detect results are qualified as estimated, UJ.

All samples

Dalapon

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 10% of the data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
All samples	Dalapon	+/-	J/UJ

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE METALS AND CYANIDE

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the CLP ILM03.0 Method; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5563

A validation was performed on the Metals Data from SDG L5563. The data was evaluated based on the following parameters.

- * ● Data Completeness
- * ● Holding Times
- * ● Calibrations
- Blanks
- * ● Interferences
- Matrix Spike Recovery
- Matrix Duplicates
- * ● Field Duplicates
- * ● Laboratory Control Samples
- Serial Dilutions
- MSAs

* - All criteria were met for this parameter.

Preparation and Field Blanks

Specific Finding

The preparation blank exhibited contamination for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Iron	11.1 mg/kg	no impact
Zinc	1.34 mg/kg	no impact

The USEPA requires that all sample values below five times the preparation, field, DI or calibration blank contamination be qualified as non-detect, "U". The field or DI water blanks exhibited contamination but had no impact on the data.

Matrix Spike Recovery

Specific Finding

The Matrix Spike recoveries for soils for Mercury and Manganese were below the lower control limits. All positive and non-detect results are qualified as estimated, "J" or "UJ".

Duplicate Analysis

Specific Finding

The Duplicate analyses for soils for Calcium, Chromium and Iron were outside the control limits. All positive results are qualified as estimated, "J". The RPD for Lead was not greater than 35% and will not be qualified. The differences for Magnesium and Nickel were not greater than 2 times the CRDL and will not be qualified.

Serial Dilution

Specific Finding

The Serial Dilution for soils for Magnesium was outside the control limits. All positive results are qualified as estimated, "J".

MSAs

Specific Finding

The post digestion spike recovery for GFAA was below the lower control limits. All positive and non-detect results for the listed samples below are qualified as estimated, "J" or "UJ".

<u>Element</u>	<u>Sample IDs</u>	<u>% recoveries</u>
Selenium	002SB02801	84
Selenium	043SB00301	78
Selenium	043SB00401	81
Selenium	043SB00402	77
Selenium	043SB00601	84
Selenium	505SB00201	74

Selenium	505SB00301	84
Selenium	505SB00701	78
Selenium	505SB00702	76
Selenium	505SB00801	69
Selenium	505SB00901	80
Selenium	GDASB00601	82
Selenium	GDASB00602	76
Selenium	GDASB00701	77
Selenium	GDASB00702	75
Selenium	GDASB00901	84
Selenium	GDASB00801	67
Selenium	GDASB01001	76
Selenium	GDASB01102	70
Selenium	GDASB01202	71
Selenium	GDASB01301	81
Selenium	GDASB01302	84

Specific Finding

The post digestion spike recovery for GFAA was above the upper control limits. All positive results for the listed samples below are qualified as estimated, "J".

<u>Element</u>	<u>Sample IDs</u>	<u>% recoveries</u>
Arsenic	GDASB01302	120

Specific Finding

All sample results left with a "B" qualifier after all other qualifications, will be qualified with a "J" qualifier in place of the "B" per Ensafe's request.

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
All samples	Hg and Mn.	+ / U	J / UJ
All samples	Ca, Cr and Fe.	+	J
All samples	Mg.	+	J
002SB02801, 042SB01001, 043SB00301, 401, 402, 502, 601, 505SB00201, 301, 701, 702, 801, 802, 901, 1101, GDASB00502, 601, 602, 701, 702, 802, 901, 1001, 1102, 1202 and 1302. GDASB01302.	Se.	+ / U	J / UJ
All "B" results	As. all analytes	+ B	J J



HEARTLAND

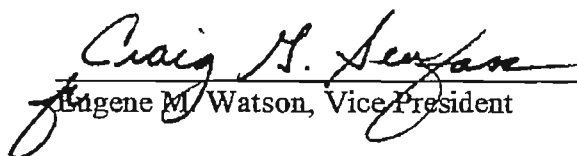
ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: 5568
Date: January 18, 1996
Client Name: Ensafe/Allen & Hoshall
Project/Site Name: Charleston Zone A
Date Sampled: October 10, 1995
Number of Samples: 2 Aqueous Sample(s) with 1 MS/MSD(s)
7 Non-aqueous Sample(s) with 3 MS/MSD(s)
Laboratory: Lockheed Analytical Services
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, June 1991 and February, 1994, respectively
QA/QC Level: EPA DQO Level III
Method(s) Utilized: SW846 Third Edition
Analytical Fractions: Volatiles, Semivolatiles, Pesticides, Organophosphorus Pesticides, Herbicides, Hexavalent Chromium, Metals, Cyanide

Analytical data in this report were screened to determine usability of results and also to determine contractual compliance relative to these requirements and deliverables. This screening assumes analytical results are correct as reported and merely provides an interpretation of the reported quality control results. A minimum of 10% of all laboratory calculations have been verified as part of this validation. All instrument output, i.e. spectra, chromatograms, etc., for each sample have been carefully reviewed. The end-user is urged to review the Specific Findings and associated Data Qualifications presented in this report. Annotated Form 1s or spreadsheets for all samples reviewed are included after the Data Assessment Narratives. Form 1s for MS/MSD samples or spreadsheets are not annotated.

The release of this Data Validation Report is authorized by the following signature:


Eugene M. Watson, Vice President

1-19-96.
Date

SDG# 5568

Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

ENSAFE ID	MATRIX	VOA		SVOA		P/P		OPP		HERB		HCR		TAL		CN	
GDA-E-B007-01	WATER	X		X		X		X		X		X		X		X	
GDA-D-B007-01	WATER	X		X		X		X		X		X		X		X	
002-C-B001-01	SOIL							X		X		X		X			
002-C-B002-01	SOIL							X		X		X		X			
002-C-B007-01	SOIL							X		X		X		X			
002-C-B011-02	SOIL							X		X		X		X			
002-C-B013-01	SOIL							X		X		X		X			
002-C-B024-02	SOIL							X		X		X		X			
001-S-B001-01	SOIL													X			
Total Billable Samples (Water/Soil)		2	0	2	0	2	0	2	6	0	8	0	8	0	9	0	2

VOA = SW846 Volatiles

SV = SW846 Semivolatiles

P/P = SW846 Pesticide/PCB's

OPP = SW846 Organophosphorus Pesticides

HERB = SW846 Herbicides

HCR = SW846 Hexavalent Chromium

TAL = SW846 Metals

CN = SW846 Cyanide

DATA ASSESSMENT NARRATIVES

DATA ASSESSMENT NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8260; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5568

A validation was performed on the Volatile Data from SDG L5568. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibration
- Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Internal Standard Performance
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Continuing Calibrations

The continuing calibration analyzed exhibited non-compliant %Ds for compounds which required qualification of the data.

**DATA ASSESSMENT NARRATIVE
VOLATILE ANALYSIS**

PAGE - 2

Continuing Calibrations, continued

Specific Findings

The continuing calibration, E0095.D, contained compounds with %Ds greater than 50% but less than 90%. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J. and the non-detect results are qualified as estimated, UJ.

GDAEB00701	chloroethane
GDADB00701	trichlorofluoromethane

Method Blanks

The method blank exhibited contamination for acetone. However, the compound was detected in the MS/MSD samples only so qualifications of the field samples were not required.

System Performance and Overall Assessment

Overall performance was acceptable. The reviewer noted that the wrong date was on the initial calibration data. Further, the laboratory did not submit internal standard area summaries. The reviewer used raw data to verify the internal standard area recoveries. The data reviewer estimates less than 5% of data required qualifications/rejections.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
GDAEB00701	chloroethane	+/-	J/UJ
GDADB00701	trichlorofluoromethane		

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

SEMIVOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8270; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5568

A validation was performed on the Semivolatile Data from SDG L5568. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Internal Standard Performance
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Continuing Calibrations

The continuing calibration standard analyzed exhibited non-compliant %Ds for three (3) compounds which required qualification of the data.

**DATA ASSESSMENT NARRATIVE
SEMIVOLATILE ANALYSIS**

PAGE - 2

Continuing Calibrations, continued

Specific Findings

The continuing calibration standard, S0301003.D and S0201002.D contained compounds with %Ds greater than 50% but less than 90%. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J, and the non-detect results are qualified as estimated, UJ.

GDAEB00701

methyl parathion

GDADB00701

n-nitrosomethylethylamine

famfur

System Performance and Overall Assessment

Overall performance was acceptable. The reviewer noted a contractual error. The laboratory analyzed an initial calibration curve using only four (4) calibration points instead of the method mandated five (5) points. The data reviewer estimates less than 5% of data required qualifications

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
GDAEB00701	methyl parathion	+/-	J/UJ
GDADB00701	n-nitrosomethylethylamine famfur		

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCLORS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8080; the National Functional Guidelines for Organic Data Validation, June 1991; and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5568

A validation was performed on the Pesticide/Aroclor Data from SDG L5568. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Initial Calibrations

One (1) initial calibration standard associated with the reported samples exhibited a correlation coefficient below the QC limit of 0.995.

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCLOL ANALYSIS

PAGE - 2

Initial Calibrations, Continued

Specific Findings

The initial calibration of 10/25/95 on GC-A contained compounds with a correlation coefficient less than 0.990 but greater than 0.850. For the samples and the non-compliant compound listed below, the positive results are qualified as estimated, J, and the non-detect results are qualified as estimated, UJ.

GDAEB00701

Isodrin

GDADB00701

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 10% of the data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
GDAEB00701	Isodrin	+/-	J/UJ
GDADB00701			

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE

ORGANOPHOSPHOROUS PESTICIDES

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8140; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5568

A validation was performed on the Organophosphorous Pesticide Data from SDG L5568. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- Calibration
- * • Blanks
- Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Initial Calibrations

The initial calibrations that were analyzed by the laboratory for these samples were not acceptable for all compound correlation coefficients.

**DATA ASSESSMENT NARRATIVE
ORGANOPHOSPHOROUS PESTICIDES**

PAGE - 2

Initial Calibrations, continued

Specific Findings

The initial calibration on 11/03/95, contained compounds with correlation coefficients less than 0.990 but greater than 0.850. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J, and the non-detect results are qualified as estimated, UJ.

GDAEB00701	disulfoton
GDADB00701	

Surrogate Recoveries

One (1) sample required qualifications based on non-compliant surrogate recoveries.

Specific Findings

The following sample exhibited surrogate recovery below the QC limits. All positive and non-detect results in the following sample are qualified as estimated, J/UJ.

GDADB00701

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates that 5% of data required qualifications/rejections.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
GDAEB00701 GDADB00701	disulfoton	+/-	J/UJ
GDADB00701	all compounds	+/-	J/UJ

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

CHLORINATED HERBICIDES

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8150; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5568

A validation was performed on the Chlorinated Herbicides from SDG L5568. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

System Performance and Overall Assessment

Overall performance was acceptable. The data did not require qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
------------------	-------------------	-----------	-----------

NO QUALIFICATIONS WERE REQUIRED

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE METALS

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the CLP ILM03.0 Method; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5568

A validation was performed on the Metals Data from SDG L5568. The data was evaluated based on the following parameters.

- * ● Data Completeness
- * ● Holding Times
- * ● Calibrations
- * ● Blanks
- * ● Interferences
- * ● Matrix Spike Recovery
- Matrix Duplicates
- Field Duplicates
- * ● Laboratory Control Samples
- Serial Dilutions
- MSAs

* - All criteria were met for this parameter.

Duplicate Analysis

Specific Finding

The Duplicate analyses for soils for Iron, Manganese and Zinc were outside the control limits. All positive results for all soil samples are qualified as estimated, "J". The RPD for Aluminum was below 35% and the RPD for Calcium was not greater than 2 times the CRDL and will not be qualified. The field duplicate for Calcium and Zinc were greater than 50% for soils. All positive results are qualified as estimated, "J".

Serial Dilution Analysis

Specific Finding

The Serial dilution for Sodium for water samples was outside the control limits. All positive results are qualified as estimated, "J".

MSAs

Specific Finding

The post digestion spike recovery for GFAA was below the lower control limits.. All positive and non-detect results for the listed samples below are qualified as estimated, "J" or "UJ".

<u>Element</u>	<u>Sample IDs</u>	<u>% recoveries</u>
Selenium	002CB00701	76
Thallium	002CB02402	78

Specific Finding

The post digestion spike recovery for GFAA was above the lupper control limits. All positive results for the listed samples below are qualified as estimated, "J".

<u>Element</u>	<u>Sample IDs</u>	<u>% recoveries</u>
Arsenic	001SB00101	122

Specific Finding

All sample results left with a "B" qualifier after all other qualifications, will be qualified with a "J" qualifier in place of the "B" per Ensafe's request.

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
All soil samples	Fe, Mn and Zn.	+	J
All soil samples	Ca and Zn.	+	J
All water samples	Na.	+	J
002CB00701	Se.	+/U	J/UJ
002CB02402	Tl.		
001SB00101	As.	+	J
All "B" results	all analytes	B	J



HEARTLAND

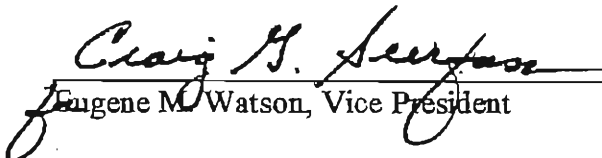
ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: 5571
Date: January 18, 1996
Client Name: Ensafe/Allen & Hoshall
Project/Site Name: Charleston Zone A
Date Sampled: October 10, 1995
Number of Samples: 45 Non-aqueous Sample(s) with 6 MS/MSD(s)
Laboratory: Lockheed Analytical Services
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, June 1991 and February, 1994, respectively
QA/QC Level: EPA DQO Level III
Method(s) Utilized: SW846 Third Edition
Analytical Fractions: Volatiles, Semivolatiles, Pesticides, Metals, Cyanide

Analytical data in this report were screened to determine usability of results and also to determine contractual compliance relative to these requirements and deliverables. This screening assumes analytical results are correct as reported and merely provides an interpretation of the reported quality control results. A minimum of 10% of all laboratory calculations have been verified as part of this validation. All instrument output, i.e. spectra, chromatograms, etc., for each sample have been carefully reviewed. The end-user is urged to review the Specific Findings and associated Data Qualifications presented in this report. Annotated Form 1s or spreadsheets for all samples reviewed are included after the Data Assessment Narratives. Form 1s for MS/MSD samples or spreadsheets are not annotated.

The release of this Data Validation Report is authorized by the following signature:


Eugene M. Watson, Vice President

1-18-96
Date

SDG# 5571

Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

ENSAFE ID	MATRIX	VOA	SVOA	P/P	TAL	CN
001-S-B001-01	SOIL	X	X	X	X	X
001-S-B001-02	SOIL	X	X	X	X	X
GDA-T-B007-01	SOIL	X				
GDA-S-B013-02	SOIL			X		
002-S-B001-01	SOIL				X	
002-S-B001-02	SOIL				X	
002-S-B002-01	SOIL				X	
002-S-B002-02	SOIL				X	
002-S-B003-01	SOIL				X	
002-S-B003-02	SOIL				X	
002-S-B004-01	SOIL				X	
002-S-B004-02	SOIL				X	
002-S-B005-01	SOIL				X	
002-S-B005-02	SOIL				X	
002-S-B006-01	SOIL				X	
002-S-B006-02	SOIL				X	
002-S-B007-01	SOIL				X	
002-S-B007-02	SOIL				X	
002-S-B008-01	SOIL				X	
002-S-B008-02	SOIL				X	
002-S-B009-01	SOIL				X	
002-S-B009-02	SOIL				X	
002-S-B010-01	SOIL				X	
002-S-B010-02	SOIL				X	
002-S-B011-01	SOIL				X	
002-S-B011-02	SOIL				X	
002-S-B012-01	SOIL				X	
002-S-B012-02	SOIL				X	
002-S-B013-01	SOIL				X	
002-S-B013-02	SOIL				X	
002-S-B014-01	SOIL				X	
002-S-B014-02	SOIL				X	
002-S-B015-01	SOIL				X	
002-S-B015-02	SOIL				X	
002-S-B019-01	SOIL				X	
002-S-B019-02	SOIL				X	
002-S-B023-01	SOIL				X	
002-S-B023-02	SOIL				X	
002-S-B024-01	SOIL				X	
002-S-B024-02	SOIL				X	
002-S-B025-01	SOIL				X	
002-S-B025-02	SOIL				X	
002-S-B026-01	SOIL				X	
002-S-B026-02	SOIL				X	
002-S-B027-01	SOIL				X	
Total Billable Samples (Water/Soil)		0 3	0 2	0 3	0 43	0 2

VOA = SW846 Volatiles
SV = SW846 Semivolatiles
P/P = SW846 Pesticide/PCB's
TAL = SW846 Metals
CN = SW846 Cyanide

DATA ASSESSMENT NARRATIVES

DATA ASSESSMENT NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8260; the National Functional Guidelines for Organic Data Review, June, 1991; DQO Level III requirements, and good professional judgement. All comments made within this report should be considered when examining the analytical results (Form I's).

SDG# L5571

A validation was performed on the Volatile Data from SDG L5571. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix spike Duplicates
- * • Field Duplicates
- * • Internal Standard Performance
- * • Compound Identification
- * • Compound Quantitation

*- All criteria were met for this parameter.

Continuing Calibration

The continuing calibration analyzed exhibited non-compliant %Ds for compounds which required qualification of the data.

DATA ASSESSMENT NARRATIVE VOLATILE ORGANICS

PAGE 2

Continuing Calibrations, continued

Specific Finding

The continuing calibration, J4034, contained compounds with %Ds greater the 50% but less than 90%. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J, and the non-detect results are qualified as estimated, UJ.

001SB00101	trichlorofluoromethane
001SB00102	vinyl acetate
001SB00102MS	
001SB00102MSD	
GDATEB00701	

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates that less than 5% of the data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis.

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
001SB00101	trichlorofluoromethane	+/-	J/UJ
001SB00102	vinyl acetate		
001SB00102MS			
001SB00102MSD			
GDATE00701			

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

SEMIVOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8270; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5571

A validation was performed on the Semivolatile Data from SDG L5571. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Internal Standard Performance
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Continuing Calibrations

The continuing calibrations standard that was analyzed exhibited a non-compliant %D for one (1) compound which required qualification of the data.

**DATA ASSESSMENT NARRATIVE
SEMIVOLATILE ANALYSIS**

PAGE - 2

Continuing Calibrations, continued

Specific Findings

The continuing calibration standard, S0201002.D contained compounds with %Ds greater than 50% but less than 90%. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J, and the non-detect results are qualified as estimated, UJ.

001SB00101	2,2'-oxybis(1-chloropropane)
001SB00101MS	
001SB00101MSD	
001SB00102	

Method Blanks

TICs were detected in the method blank. All B flagged TICs in all samples are rejected, R.

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 5% of data required qualifications

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
001SB00101	2,2'-oxybis(1-chloropro.)	+/-	J/UJ
001SB00101MS			
001SB00101MSD			
001SB00102			

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCLORS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8080; the National Functional Guidelines for Organic Data Validation, June 1991; and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5571

A validation was performed on the Pesticide/Aroclor Data from SDG L5571. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- * • Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 10% of the data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

SAMPLE ID

ANALYTE ID

DL

QL

NO QUALIFICATIONS ARE REQUIRED.

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE METALS

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the CLP ILM03.0 Method; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5571

A validation was performed on the Metals Data from SDG L5571. The data was evaluated based on the following parameters.

- * ● Data Completeness
- * ● Holding Times
- * ● Calibrations
- Blanks
- * ● Interferences
- Matrix Spike Recovery
- Matrix Duplicates
- * ● Field Duplicates
- * ● Laboratory Control Samples
- * ● Serial Dilutions
- MSAs

* - All criteria were met for this parameter.

Preparation and Field Blanks

Specific Finding

The preparation blank exhibited negative bias for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Magnesium	-8.80 mg/kg	No impact

The USEPA requires that the reviewer estimated the impact from negative bias. This reviewer requires that all positive and non-detect results below ten times the negative bias will be qualified as estimated, "J" or "UJ".

Matrix Spike Analysis

Specific Finding

The Matrix Spike analyses for Antimony, Lead and Selenium were below the lower control limits. All positive and non-detect results for all soil samples are qualified as estimated, "J" or "UJ".

Duplicate Analysis

Specific Finding

The Duplicate analyses for Iron, Manganese and Zinc outside the control limits. All positive results for all soil samples are qualified as estimated, "J".. The RPDs for Aluminum, Calcium and Lead were not greater than 35% and will not be qualified.

MSAs

Specific Finding

The post digestion spike recovery for GFAA was below the lower control limits. All positive and non-detect results for the listed samples below are qualified as estimated, "J" or "UJ".

<u>Element</u>	<u>Sample IDs</u>	<u>% recoveries</u>
Selenium	002SB00601	83
Thallium	002SB01201	44

The post digestion spike recovery for GFAA was above the upper control limits. All positive results for the listed samples below are qualified as estimated, "J".

<u>Element</u>	<u>Sample IDs</u>	<u>% recoveries</u>
Arsenic	001SB00101	122
Arsenic	002SB00702	125
Arsenic	002SB00102	117
Arsenic	002SB00701	118
Arsenic	002SB01202	118

Specific Finding

All sample results left with a "B" qualifier after all other qualifications, will be qualified with a "J" qualifier in place of the "B" per Ensafe's request.

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
All samples	Sb, Pb and Se.	+/U	J/UJ
All samples	Fe, Mn and Zn.	+	J
002SB00601.	Tl.	+/U	J/UJ
002SB01201.	Se.		
001SB00101, 002SB00702, 102, 701 and 1202.	As.	+	J
All "B" results	all analytes	B	J



HEARTLAND

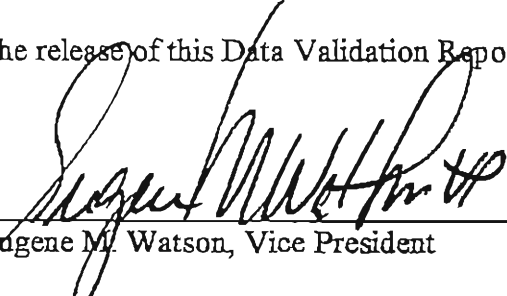
ENVIRONMENTAL SERVICES, INC.

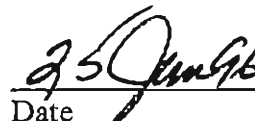
Data Validation Report

SDG#: L5583
Date: January 25, 1996
Client Name: Ensafe
Project/Site Name: Charleston Zone A
Date Sampled: October 11, 1995
Number of Samples: 3 Aqueous Sample(s) with 3 MS/MSD(s)
4 Non-aqueous Sample(s) with 4 MS/MSD(s)
Laboratory: Lockheed Analytical Services
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, June 1991 and February, 1994, respectively
QA/QC Level: EPA DQO Level IV
Method(s) Utilized: SW846 Third Edition
Analytical Fractions: Volatiles, Semivolatiles, Pesticides/PCB's, Herbicides, Organophosphorus Pesticides, Dioxin, Hexavalent Chromium, Metals, Cyanide

Analytical data in this report were screened to determine usability of results and also to determine contractual compliance relative to these requirements and deliverables. This screening assumes analytical results are correct as reported and merely provides an interpretation of the reported quality control results. A minimum of 10% of all laboratory calculations have been verified as part of this validation. All instrument output, i.e. spectra, chromatograms, etc., for each sample have been carefully reviewed. The end-user is urged to review the Specific Findings and associated Data Qualifications presented in this report. Annotated Form 1s or spreadsheets for all samples reviewed are included after the Data Assessment Narratives. Form 1s for MS/MSD samples or spreadsheets are not annotated.

The release of this Data Validation Report is authorized by the following signature:


Eugene M. Watson, Vice President


Date

SDG# L5583

Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

ENSAFE ID	MATRIX	VOA	SVOA	P/P	HERB	OPP	DIOX	HCR	TAL	CN
506CB00202	SOIL	X	X		X	X		X	X	
GDA7000101	WATER	X	X	X	X	X	X	X	X	X
GDAE000101	WATER	X	X	X	X	X	X	X	X	X
GDACB01101	SOIL		X							
002CB00701	SOIL					X				
002CB01301	SOIL				X					
GDAEB00701	WATER								X	
Total Billable Samples (Water/Soil)		2	1	2	2	0	2	2	2	0

VOA = SW846 Volatiles

SV = SW846 Semivolatiles

P/P = SW846 Pesticide/PCB's

OPP = SW846 Organophosphorus Pesticides

HERB = SW846 Herbicides

DIOX = SW846 Dioxin

HCR = SW846 Hexavalent Chromium

TAL = SW846 Metals

CN = SW846 Cyanide

DATA ASSESSMENT NARRATIVES

DATA ASSESSMENT NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8260; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5583

A validation was performed on the Volatile Data from SDG L5583. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- GC/MS Tuning
- Calibration
- Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- Internal Standard Performance
- * • Compound Identification
- Compound Quantitation

* - All criteria were met for this parameter.

GC/MS Tuning

The tunes found in the data package for this SDG did not meet criteria. However, tunes which were processed correctly were found in the data package for SDG 5552 and were used to validate this SDG.

Continuing Calibrations

The continuing calibration analyzed exhibited non-compliant %Ds and RRFs for compounds which required qualification of the data.

DATA ASSESSMENT NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8260; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5583

A validation was performed on the Volatile Data from SDG L5583. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- GC/MS Tuning
- Calibration
- Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- Internal Standard Performance
- * • Compound Identification
- Compound Quantitation

* - All criteria were met for this parameter.

GC/MS Tuning

The tunes found in the data package for this SDG did not meet criteria. However, tunes which were processed correctly were found in the data package for SDG 5552 and were used to validate this SDG.

Continuing Calibrations

The continuing calibration analyzed exhibited non-compliant %Ds and RRFs for compounds which required qualification of the data.

**DATA ASSESSMENT NARRATIVE
VOLATILE ANALYSIS**

PAGE - 2

Continuing Calibrations, continued

Specific Findings

The continuing calibration, E0095.D, contained compounds with %Ds greater than 50% but less than 90%. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J. and the non-detect results are qualified as estimated, UJ.

506CB00202	acetone
506CB00202MS	2-butanone
506CB00202MSD	

The continuing calibration, E0095.D, contained compounds with RRFs less than 0.05. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J. and the non-detect results are rejected, R.

506CB00202	isobutanol
506CB00202MS	1,4-dioxane
506CB00202MSD	

The continuing calibration, E0114.D, contained compounds with %Ds greater than 50% but less than 90%. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J. and the non-detect results are qualified as estimated, UJ.

GDA7000101	chloroethane
GDAE000101	
GDAE000101MS	
GDAE000101MSD	

The continuing calibration, E0095.D, contained compounds with RRFs less than 0.05. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J. and the non-detect results are rejected, R.

GDA7000101	1,4-dioxane
GDAE000101	
GDAE000101MS	
GDAE000101MSD	

DATA ASSESSMENT NARRATIVE VOLATILE ANALYSIS

PAGE - 3

Internal Standards

One (1) sample, the MS and MSD of the sample, and the RE of the sample exhibited similar non-compliant internal standard areas.

Specific Finding

The samples listed below exhibited low internal standard areas. All associated positive and non-detect results are qualified as estimated, J/UJ.

506CB00202	dichlorobenzene-d ₅
506CB00202RE	
506CB00202MS	

506CB00202MSD	all internal standards
---------------	------------------------

Surrogate Recoveries

One (1) sample and the MS/MSD pair exhibited recoveries below the QC limits for bromofluorobenzene.

Specific Finding

The following samples exhibited non-compliant recoveries for one (1) surrogate compound. All positive and non-detect results in the samples are qualified as estimated, J/UJ.

506CB00202
506CB00202MS
506CB00202MSD

Compound Identification

Specific Finding

The following sample was reanalyzed due to poor response for one (1) internal standard. The original analysis of the sample is rejected, R, in favor of the results reported from the RE sample.

506CB00202

**DATA ASSESSMENT NARRATIVE
VOLATILE ANALYSIS**

PAGE - 4

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 5 % of data required qualifications/rejections.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
506CB00202	acetone	+/-	J/UJ
506CB00202MS	2-butanone		
506CB00202MSD			
506CB00202	isobutanol	+/-	J/R
506CB00202MS	1,4-dioxane		
506CB00202MSD			
GDA7000101	chloroethane	+/-	J/UJ
GDAE000101			
GDAE000101MS			
GDAE000101MSD			
GDA7000101	1,4-dioxane	+/-	J/R
GDAE000101			
GDAE000101MS			
GDAE000101MSD			
506CB00202	All associated with dichlorobenzene-d ₅	+/-	J/UJ
506CB00202RE			
506CB00202MS			
506CB00202MSD	All associated with all internal standards	+/-	J/UJ
506CB00202	All Compounds	+/-	J/UJ
506CB00202MS			
506CB00202MSD			
506CB00202	All Compounds	+/-	R

- * DL denotes the Form I qualifier supplied by the laboratory
 QL denotes the qualifier used by the data validation firm
 + in the DL column denotes a positive result
 - in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCLORS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8080; the National Functional Guidelines for Organic Data Validation, June 1991; and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5583

A validation was performed on the Pesticide/Aroclor Data from SDG L5583. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Contractual Non-Compliance

The method requires that all target compounds, including the multi-component compounds, be analyzed with a five (5) point calibration curve. The laboratory analyzed a single point curve for the Aroclors 1221, 1232, 1242, 1248, and 1254, Toxaphene, and Chlordane. The data did not require qualification because no positive results were reported for the compounds analyzed with a single point calibration.

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCLOR ANALYSIS

PAGE - 2

Initial Calibrations

One (1) initial calibration standard associated with the reported samples exhibited a correlation coefficient below the QC limit of 0.995.

Specific Findings

The initial calibration of 10/25/95 on GC-A contained compounds with a correlation coefficient less than 0.990 but greater than 0.850. For the samples and the non-compliant compound listed below, the positive results are qualified as estimated, J, and the non-detect results are qualified as estimated, UJ.

GDA7000101
GDAE000101

Isodrin

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 10% of the data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
GDA7000101	Isodrin	+/-	J/UJ
GDAE000101			

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE

CHLORINATED HERBICIDES

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8150; the National Functional Guidelines for Organic Data Validation, June 1991; and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5583

A validation was performed on the Herbicide Data from SDG L5583. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- * • Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 10% of the data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
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NO QUALIFICATIONS ARE REQUIRED.

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE

ORGANOPHOSPHORUS PESTICIDES

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8140; the National Functional Guidelines for Organic Data Validation, June 1991; and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5583

A validation was performed on the Organophosphorus Pesticide Data from SDG L5583. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- Calibration
- * • Blanks
- Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Initial Calibrations

Several initial calibration standards associated with the reported samples exhibited correlation coefficients below the QC limit of 0.995.

DATA ASSESSMENT NARRATIVE
PESTICIDE/AROCLOR ANALYSIS

PAGE - 2

Initial Calibrations, Continued

Specific Findings

The initial calibration of 11/03/95 contained compounds with correlation coefficients less than 0.990 but greater than 0.850. For the samples and the non-compliant compounds listed below, the positive results are qualified as estimated, J, and the non-detect results are qualified as estimated, UJ.

GDA7000101	Disulfoton
GDAE000101	

Surrogate Recoveries

One (1) field sample exhibited a non-compliant Tributyl Phosphate recovery.

Specific Finding

The sample listed below exhibited a low DCB recovery. The positive results are qualified as estimated, J, and the non-detect results are qualified as estimated, UJ.

GDAE000101

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 10% of the data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
GDA7000101 GDAE000101	Disulfoton	+/-	J/UJ
GDAE000101	ALL	+/-	J/UJ

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE

DIOXIN/FURANS - 8290

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, internal standard recoveries, clean-up standard recoveries, matrix spike recoveries, GC/MS high resolution performance, tuning results, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. SW-846 Method 8290; the National Functional Guidelines for Organic Data Review, where applicable; and EPA DQO Level IV requirements. Please refer the specific findings found in each category to the Summary of Data Qualifications table.

SDG# L5583

A validation was performed on the Dioxin/Furan Data from SDG 23560. The data was evaluated based on the following parameters.

*	•	Data Completeness
*	•	Holding Times
*	•	Mass Resolution Checks
*	•	Column Performance
*	•	Calibrations
*	•	Internal Standard Recovery
	•	Blanks
*	•	Laboratory Control Samples
N/A	•	Matrix Spike/Matrix Spike Duplicate
*	•	Field Duplicates
*	•	Congener Identification/Quantitation

* - All criteria were met for this parameter.

Blanks

The method blank exhibited positive results for OCDD and 2,3,4,6,7,8-HxCDF at concentration of 53.1 pg/L and 1.8 pg/L, respectively (see Table 1). The associated samples exhibited positive results 2,3,4,6,7,8-HxCDF at concentrations very similar to the method blank (2.3-2.4 pg/L).

Data Assessment Narrative

Page - 2

Table 1

Congener ID	MB Conc. (pg/L)	GDA7000101	Q	GDAE000101	Q
OCDD	53.1				
2,3,4,6,7,8-HxCDF	1.8	2.3	U	2.4	U

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

- U** = Not detected
- J** = Estimated value
- UJ** = Reported Quantitation limit is qualified as estimated
- R** = Result is rejected and unusable
- D** = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

- CRQL** = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.
- U** = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.
- No Action** = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>CONGENER ID</u>	<u>DL</u>	<u>QL</u>
All samples	2,3,4,6,7,8-HxCDF	+B	U

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE METALS, CYANIDE and HEX CR

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the CLP ILM03.0 Method; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5583

A validation was performed on the Metals Data from SDG L5583. The data was evaluated based on the following parameters.

- * ● Data Completeness
- * ● Holding Times
- * ● Calibrations
- Blanks
- * ● Interferences
- Matrix Spike Recovery
- * ● Matrix Duplicates
- * ● Field Duplicates
- * ● Laboratory Control Samples
- Serial Dilutions
- * ● MSAs

* - All criteria were met for this parameter.

Preparation and Field Blanks

Specific Finding

The preparation blank exhibited contamination for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Calcium	17.8 mg/kg	No impact
Iron	3.99 mg/kg	No impact
Magnesium	8.76 mg/kg	No impact
Sodium	20.7 mg/kg	No impact
Zinc	1.07 mg/kg	No impact

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Antimony	78.0 ug/l	No impact
Iron	32.2 ug/l	No impact
Sodium	77.6 ug/l	No impact
Zinc	3.76 ug/l	No impact

The USEPA requires that all sample values below five times the preparation, field, DI or calibration blank contamination be qualified as estimated, "U". The field or DI water blanks exhibited contamination but had no impact on the data.

Duplicate Analysis

Specific Finding

The Duplicate analysis for soils for Iron was outside the control limits. All positive results are qualified as estimated, "J".

Serial Dilution Analysis

Specific Findings

The Serial Dilution for waters for Sodium was outside the control limits. All positive results are qualified as estimated, "J".

Specific Finding

All sample results left with a "B" qualifier after all other qualifications, will be qualified with a "J" qualifier in place of the "B" per Ensafe's request.

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
All soil samples	Fe.	+	J
All water samples	Na.	+	J
All "B" results	all analytes	B	J



HEARTLAND

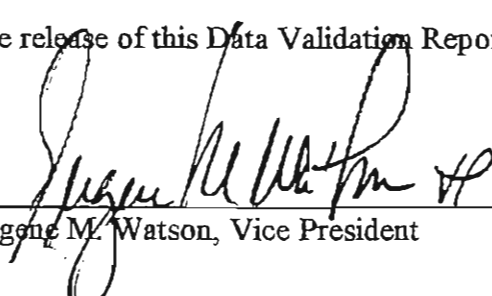
ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: L5586
Date: January 26, 1996
Client Name: Ensafe, Inc.
Project/Site Name: Charleston Zone A
Date Sampled: October 11, 1995
Number of Samples: 17 Non-aqueous Sample(s) with 1 MS/MSD(s)
Laboratory: Lockheed Analytical Services
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, June 1991 and February, 1994, respectively
QA/QC Level: EPA DQO Level IV
Method(s) Utilized: SW846 Third Edition
Analytical Fractions: Volatiles, Semivolatiles, Pesticide/PCB's, Metals, and Cyanide

Analytical data in this report were screened to determine usability of results and also to determine contractual compliance relative to these requirements and deliverables. This screening assumes analytical results are correct as reported and merely provides an interpretation of the reported quality control results. A minimum of 10% of all laboratory calculations have been verified as part of this validation. All instrument output, i.e. spectra, chromatograms, etc., for each sample have been carefully reviewed. The end-user is urged to review the Specific Findings and associated Data Qualifications presented in this report. Annotated Form 1s or spreadsheets for all samples reviewed are included after the Data Assessment Narratives. Form 1s for MS/MSD samples or spreadsheets are not annotated.

The release of this Data Validation Report is authorized by the following signature:


Eugene M. Watson, Vice President

31 Jan 96
Date

SDG# L5586

Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

Ensafe ID	Matrix	VOA		SV		P/P		TAL		CN	
506SB00101	SOIL		X		X				X		
506SB00102	SOIL		X		X				X		
506SB00201	SOIL		X		X				X		
506SB00202	SOIL		X		X				X		
506SB00301	SOIL		X		X				X		
506SB00302	SOIL		X		X				X		
506SB00401	SOIL		X		X				X		
506SB00402	SOIL		X		X				X		
506SB00501	SOIL		X		X				X		
506SB00502	SOIL		X		X				X		
506SB00601	SOIL		X		X				X		
506SB00602	SOIL		X		X				X		
GDASB01401	SOIL		X		X		X		X		X
GDASB01402	SOIL		X		X		X		X		X
GDASB01302	SOIL						X				
002M000101	SOIL								X		
002M000201	SOIL								X		
Total Billable Samples (Water/Soil)		0	14	0	14	0	3	0	16	0	2

VOA = SW846 Volatiles

SV = SW846 Semivolatiles

P/P = SW846 Pesticide/PCB's

GRO = SW846 Gasoline Range Organics

DRO = SW846 Diesel Range Organics

TAL = CLP Metals

DATA ASSESSMENT NARRATIVES

DATA ASSESSMENT AND NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA SW846, Method 8260 Appendix IX; the National Functional Guidelines for Organic Data Review, June 1991, and DQO Level III. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualifications table.

SDG # L5586

A validation was performed on the Volatile Data from SDG L5586, The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibrations
- Internal Standard Performance
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- * • Compound Identification /Quantitation

* - All criteria were met for this parameter

Continuing calibrations

The continuing calibrations that were analyzed with this data package exhibited %Ds that were not within %D continuing calibration criteria. All RRFs were within calibration criteria.

**DATA ASSESSMENT AND NARRATIVE
VOLATILE ANALYSIS**

PAGE - 2

Continuing calibrations (continued)

Specific Finding:

The continuing calibration, J4086, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

506SB00601	trichlorofluoromethane
506SB00602	
506SB00302	
506SB00201	
506SB00101	
506SB00401	
GDASB01401	
GDASB01402	

The continuing calibration, J4086, contained compounds with %Ds greater than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and reject all non detects (R).

506SB00601	chloroethane
506SB00602	
506SB00302	
506SB00201	
506SB00101	
506SB00401	
GDASB01401	
GDASB01402	

The continuing calibration, J4105, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

506SB00301	trichlorofluoromethane
506SB00202	
506SB00102	
506SB00501	
506SB00502	

**DATA ASSESSMENT AND NARRATIVE
VOLATILE ANALYSIS**

PAGE - 3

Continuing calibrations (continued)

Specific Finding:

The continuing calibration, J4124, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

506SB00402	trichlorofluoromethane
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Internal Standards

All internal standard EICP areas did not meet the internal standard EICP area QA/QC criteria.

Specific Finding:

The Samples listed below, exhibited low internal standard areas. Qualify all associated positive results as estimated (J) and all non detects as estimated (UJ).

506SB00201	1,4-dichlorobenzene-d ₄
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System Performance and Overall Assessment

The overall system performance was fair. The laboratory did not encounter any large problems. The data reviewer estimates that less than 5% of the data is qualified.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on the dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
506SB00601	trichlorofluoromethane	+/-	J/UJ
506SB00602			
506SB00302			
506SB00201			
506SB00101			
506SB00401			
GDASB01401			
GDASB01402			
506SB00601	chloroethane	+/-	J/R
506SB00602			
506SB00302			
506SB00201			
506SB00101			
506SB00401			
GDASB01401			
GDASB01402			
506SB00301	trichlorofluoromethane	+/-	J/UJ
506SB00202			
506SB00102			
506SB00501			
506SB00502			
506SB00402	trichlorofluoromethane	+/-	J/UJ
506SB00201	All associated analytes 1,4-dichlorobenzene-d ₄	+/-	J/R

- * DL denotes the Form I qualifier supplied by the laboratory
 QL denotes the qualifier used by the data validation firm
 + in the DL column denotes a positive result
 - in the DL column denotes a non detect result

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA SW846, Method 8270 Appendix IX; National Functional Guidelines for Organic Data Review, and DQO Level III. All comments made within this report should be considered when examining the analytical results (Form I's).

SDG # L5586

A validation was performed on the Semivolatile Data from SDG L5586. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- * • Calibrations
- Internal Standard Performance
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- * • Compound Identification /Quantitation

* - All criteria were met for this parameter

Internal Standards

All internal standard EICP areas did not meet the internal standard EICP area QA/QC criteria.

Specific Finding:

The samples listed below, exhibited low internal standard areas. Qualify all associated positive results as estimated (J) and all non detects as estimated (UJ).

506SB000102

acenaphthene-d₁₀

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ANALYSIS

PAGE - 2

Compound Identification/Quantitation

Specific Finding:

For sample 506SB00102, reject all E-flagged results in favor of the D-flagged results in the diluted sample. For the diluted samples 506SB00102DL and 506SB00102DL2, reject all results (UR) except for the D-flagged results with corresponding E-flagged results.

System Performance and Overall Assessment

The overall system performance was fair. The laboratory did not encounter any large problems. The data reviewer estimates that less than 5% of the data is qualified.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on the dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
506SB000102	All associated analytes acenaphthene-d ₁₀	+/-	J/UJ
506SB00102	All E-flagged results	+	R
506SB00102DL 506SB00102DL2	All results except D-flagged results	+/-	R

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

CHLORINATED PESTICIDES/PCBs

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8080; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5586

A validation was performed on the Chlorinated Pesticide/PCB Data from SDG L5586. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Initial Calibration

The 4,4'-DDT breakdown was above the 20% QC limit on both columns. The reported result for 4,4'-DDE in sample GDASB01401 is qualified as estimated, J. However, the result should be considered as present based on presumptive evidence due to the non-compliant breakdown of the 4,4'-DDT in the breakdown standard.

Specific Finding

The breakdown for 4,4'-DDT was above the QC limit in the breakdown standard analyzed on both columns. The reported non-detect result for 4,4'-DDT is rejected, R, and the reported 4,4'-DDE result is qualified as estimated, J, in sample GDASB01401.

**DATA ASSESSMENT NARRATIVE
CHLORINATED PESTICIDES/PCBs**

PAGE - 2

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates that 5 % of data required qualifications/rejections.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
GDASB01401	4,4'-DDT	-	R
	4,4'-DDE	+	J

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

METALS

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the CLP ILM03.0 Method; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5586

A validation was performed on the Metals Data from SDG L5506. The data was evaluated based on the following parameters.

- * ● Data Completeness
- * ● Holding Times
- * ● Calibrations
- Blanks
- * ● Interferences
- * ● Matrix Spike Recovery
- Matrix Duplicates
- * ● Field Duplicates
- * ● Laboratory Control Samples
- * ● Serial Dilutions
- MSAs

* - All criteria were met for this parameter.

Preparation and Field Blanks

Specific Finding

The preparation blank exhibited contamination for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Calcium	17.8 mg/kg	no impact
Iron	3.99 mg/kg	no impact
Magnesium	8.76 mg/kg	no impact
Sodium	20.7 mg/kg	no impact
Zinc	1.07 mg/kg	no impact

The USEPA requires that all sample values below five times the preparation, field, DI or calibration blank contamination be qualified as estimated, "U". The field or DI water blanks exhibited contamination but had no impact on the data.

Duplicate Analysis

Specific Finding

The Duplicate analysis for Iron was outside the control limits. All positive results for all water samples are qualified as estimated, "J".

MSAs

Specific Finding

The post digestion spike recovery for GFAA was below the lower control limits. All positive and non-detect results for the listed samples below are qualified as estimated, "J" or "UJ".

<u>Element</u>	<u>Sample IDs</u>	<u>% recoveries</u>
Selenium	002M000101	75
Selenium	GDASB01402	80
Selenium	506SB00402	84

The post digestion spike recovery for GFAA was above the upper control limits. All positive results for the listed samples below are qualified as estimated, "J".

<u>Element</u>	<u>Sample IDs</u>	<u>% recoveries</u>
Arsenic	506SB00302	125
Thallium	506SB00601	117
Thallium	GDASB01041	116
Thallium	GDASB01402	117
Thallium	506SB00301	117
Thallium	506SB00302	117
Thallium	506SB00201	116
Thallium	506SB00101	115
Thallium	506SB00102	116
Thallium	506SB00301	116

Specific Finding

All sample results left with a "B" qualifier after all other qualifications, will be qualified with a "J" qualifier in place of the "B" per Ensafe's request.

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
All soil samples	Fe.	+	J
002M000101 and GDASB01402	Se.	+/U	J/UJ
506SB00302	As.	+	J
506SB00601, 301, 302, 201, 101, 102 and 301, GDASB010401 and 1402.	Tl.		
All "B" results	all analytes	B	J



HEARTLAND

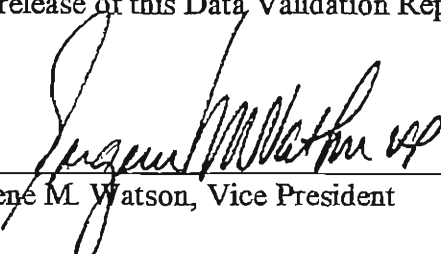
ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: L5848
Date: January 26, 1996
Client Name: Ensafe, Inc.
Project/Site Name: Charleston Zone A
Date Sampled: November 14, 1995
Number of Samples: 4 Aqueous Sample(s) with 1 MS/MSD(s)
Laboratory: Lockheed Analytical Services
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, June 1991 and February, 1994, respectively
QA/QC Level: EPA DQO Level III
Method(s) Utilized: SW846 Third Edition
Analytical Fractions: Volatiles, Semivolatiles, Pesticide/PCB's, Metals, and Cyanide

Analytical data in this report were screened to determine usability of results and also to determine contractual compliance relative to these requirements and deliverables. This screening assumes analytical results are correct as reported and merely provides an interpretation of the reported quality control results. A minimum of 10% of all laboratory calculations have been verified as part of this validation. All instrument output, i.e. spectra, chromatograms, etc., for each sample have been carefully reviewed. The end-user is urged to review the Specific Findings and associated Data Qualifications presented in this report. Annotated Form 1s or spreadsheets for all samples reviewed are included after the Data Assessment Narratives. Form 1s for MS/MSD samples or spreadsheets are not annotated.

The release of this Data Validation Report is authorized by the following signature:



Eugene M. Watson, Vice President



Date

SDG# L5848

Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

Ensafe ID	Matrix	VOA		SV		P/P		TAL		CN	
GDA7003D01	WATER	X		X		X		X		X	
GDAT003D01	WATER	X									
GDA3003D01	WATER	X		X		X		X		X	
GDAEB03D01	WATER	X		X		X		X		X	
Total Billable Samples (Water/Soil)		4	0	3	0	3	0	3	0	3	0

VOA= SW846 Volatiles

SV= SW846 Semivolatiles

P/P= SW846 Pesticide/PCB's

TAL= CLP Metals

CN= Cyanide

DATA ASSESSMENT NARRATIVES

DATA ASSESSMENT AND NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA SW846, Method 8260 Appendix IX; the National Functional Guidelines for Organic Data Review, June 1991, and DQO Level III. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualifications table.

SDG # L5848

A validation was performed on the Volatile Data from SDG L5848, The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibrations
- * • Internal Standard Performance
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- * • Compound Identification /Quantitation

* - All criteria were met for this parameter

Continuing calibrations

The continuing calibrations that were analyzed with this data package exhibited %Ds that were not within %D continuing calibration criteria. All RRFs were within calibration criteria.

**DATA ASSESSMENT AND NARRATIVE
VOLATILE ANALYSIS**

PAGE - 2

Continuing calibrations (continued)

Specific Finding:

The continuing calibration, J4086, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

GDA7003D01	trichlorofluoromethane
GDAE03D01	
GDA7003D01	
GDA3003D01	

Rinseate Blanks

<u>Associated blank</u>	<u>Compound</u>	<u>Concentration</u>
GDAE03D01	chloroform	5.1J ug/L
<u>Samples</u>	<u>Compound</u>	<u>Qualification</u>
GDA7003D01	chloroform	U

System Performance and Overall Assessment

The overall system performance was fair. The laboratory did not encounter any large problems. The data reviewer estimates that less than 5% of the data is qualified.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on the dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
GDA7003D01	trichlorofluoromethane	+/-	J/UJ
GDAEB03D01			
GDA7003D01			
GDA3003D01			
GDA7003D01	chloroform	+	U

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA SW846, Method 8270 Appendix IX; National Functional Guidelines for Organic Data Review, and DQO Level III. All comments made within this report should be considered when examining the analytical results (Form I's).

SDG # L5848

A validation was performed on the Semivolatile Data from SDG L5848. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- * • Calibrations
- * • Internal Standard Performance
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- * • Compound Identification /Quantitation

* - All criteria were met for this parameter

Rinseate Blanks

<u>Associated blank</u>	<u>Compound</u>	<u>Concentration</u>
GDAEB03D01	benzoic acid	39J ug/L
<u>Samples</u>	<u>Compound</u>	<u>Qualification</u>
GDA7003D01	benzoic acid	U

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ANALYSIS

PAGE - 2

Compound Identification/Quantitation

Specific Finding:

Reject all results for the re-analyzed samples GDA30003D01RE and GDAEB03D01RE, in favor of the original sample analysis because the re-analysis was not required..

System Performance and Overall Assessment

The overall system performance was fair. The laboratory did not encounter any large problems. The data reviewer estimates that less than 5% of the data is qualified.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D= Result value is based on the dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
GDA7003D01	benzoic acid	+	U
GDA30003D01RE GDAEB03D01RE	All analytes	+/-	R

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

CHLORINATED PESTICIDES

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8080; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5848

A validation was performed on the Chlorinated Pesticide Data from SDG L5848. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

System Performance and Overall Assessment

Overall performance was acceptable. The data did not require qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
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NO QUALIFICATIONS WERE REQUIRED

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE METALS AND CYANIDE

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the CLP ILM03.0 Method; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5848W

A validation was performed on the Metals Data from SDG L5848W. The data was evaluated based on the following parameters.

- * ● Data Completeness
- * ● Holding Times
- * ● Calibrations
- Blanks
- * ● Interferences
- * ● Matrix Spike Recovery
- * ● Matrix Duplicates
- * ● Field Duplicates
- * ● Laboratory Control Samples
- Serial Dilutions
- MSAs

* - All criteria were met for this parameter.

Preparation and Field Blanks

Specific Finding

The preparation blank exhibited contamination for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Aluminum	80.6 ug/l	GDA3003D01.
Calcium	214. ug/l	GDA7003D01.
Iron	12.7 ug/l	GDA7003D01.
Magnesium	47.6 ug/l	no impact
Sodium	430. ug/l	no impact

The USEPA requires that all sample values below five times the preparation, field, DI or calibration blank contamination be qualified as non-detect, "U". The field or DI water blanks exhibited contamination but had no impact on the data.

Serial Dilution

Specific Finding

The Serial Dilutions for waters for Iron and Sodium were outside the control limits. All positive results are qualified as estimated, "J".

MSAs

Specific Finding

The post digestion spike recovery for GFAA was above the upper control limits. All positive results for the listed samples below are qualified as estimated, "J".

<u>Element</u>	<u>Sample IDs</u>	<u>% recoveries</u>
Selenium	GDAEB03D01	116

Specific Finding

All sample results left with a "B" qualifier after all other qualifications, will be qualified with a "J" qualifier in place of the "B" per Ensafé's request.

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
GDA3003D01.	Al.	+	U
GDA7003D01.	Ca and Fe.		
all samples	Fe and Na.	+	J
GDAEB03D01.	Se.	+	J
All "B" results	all analytes	B	J



HEARTLAND

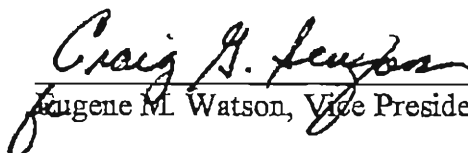
ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: L5958
Date: February 15, 1996
Client Name: Ensafe/Allen & Hoshall
Project/Site Name: Charleston; Zone A
Date Sampled: December 4, 1995
Number of Samples: 1 Aqueous Sample(s) with 1 MS/MSD(s)
Laboratory: Lockheed Analytical Services
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, June 1991 and February, 1994, respectively
QA/QC Level: EPA DQO Level III
Method(s) Utilized: SW846 Third Edition
Analytical Fractions: Volatiles, Semivolatiles, Pesticides w/PCB's, Herbicides, Organophosphorus Pesticides, Petroleum Hydrocarbons, Dissolved Solids, Chlorides, Sulfates, Hexavalent Chromium, Metals, Cyanide

Analytical data in this report were screened to determine usability of results and also to determine contractual compliance relative to these requirements and deliverables. This screening assumes analytical results are correct as reported and merely provides an interpretation of the reported quality control results. A minimum of 10% of all laboratory calculations have been verified as part of this validation. All instrument output, i.e. spectra, chromatograms, etc., for each sample have been carefully reviewed. The end-user is urged to review the Specific Findings and associated Data Qualifications presented in this report. Annotated Form 1s or spreadsheets for all samples reviewed are included after the Data Assessment Narratives. Form 1s for MS/MSD samples or spreadsheets are not annotated.

The release of this Data Validation Report is authorized by the following signature:


Eugene M. Watson, Vice President

2-22-96
Date

SDG# L5958

Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

ENSAFE ID	MATRIX	VOA		SV		P/P		HERB		OPP		TPH		TDS		CHL		SUL		HCR		TAL		CN	
042EW00201	WATER	X		X		X		X		X		X		X		X		X		X		X		X	
Total Billable Samples (Water/Soil)		1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0

VOA = SW846 Volatiles

SV = SW846 Semivolatiles

P/P = SW846 Pesticide/PCB's

HERB = SW846 Herbicides

OPP = SW846 Organophosphorus Pesticides

TPH = SW846 Petroleum Hydrocarbons

TDS = SW846 Dissolved Solids

CHL = SW846 Chlorides

SUL = SW846 Sulfates

HCR = SW846 Hexavalent Chromium

TAL = SW846 Metals

CN = SW846 Cyanide

DATA ASSESSMENT NARRATIVES

DATA ASSESSMENT NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8260; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5958

A validation was performed on the Volatile Data from SDG L5958. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Internal Standard Performance
- * • Compound Identification
- Compound Quantitation

* - All criteria were met for this parameter.

Initial Calibration

The target compound chloroprene was calibrated as a single point with the BFB tune injection. The compound was not present in the ICAL or CCAL standards.

Specific Findings

The following compound is rejected in all samples due to an invalid calibration.

All samples

Chloroprene

**DATA ASSESSMENT NARRATIVE
VOLATILE ANALYSIS**

PAGE - 2

Continuing Calibrations

The continuing calibration analyzed exhibited non-compliant %Ds and RRFs for compounds which required qualification of the data.

Specific Findings

The continuing calibration, E0771.D, contained compounds with %Ds greater than 50% but less than 90%. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J. and the non-detect results are qualified as estimated, UJ.

042EW00201 chloroethane

The continuing calibration, E0771.D, contained compounds with RRFs less than 0.05. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J. and the non-detect results are rejected, R.

042EW00201 1,4-dioxane

System Performance and Overall Assessment

Overall performance was acceptable with the exception of the compound chloroprene. The data reviewer estimates less than 5% of data required qualifications/rejections.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
All samples	Chloroprene	+/-	J/R
042EW00201	chloroethane	+/-	J/UJ
042EW00201	1,4-dioxane	+/-	J/R

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA 8270 Appendix IX; National Functional Guidelines for Organic Data Review, and DQO Level III. All comments made within this report should be considered when examining the analytical results (Form I's).

SDG # L5958

A validation was performed on the Semivolatile Data from SDG L5958. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- * • Calibrations
- * • Internal Standard Performance
- * • Blanks
- * • Surrogate Recoveries
- * • Laboratory Control Sample
- * • Field Duplicates
- * • Compound Identification /Quantitation

* - All criteria were met for this parameter

Contractual Non compliance

The laboratory is not evaluating sample surrogate recoveries based on the multi-laboratory limits found in the SW846 method 8270 on page 8270-31. The laboratory evaluated the sample surrogate recoveries based on their own laboratory generated limits. Heartland ESI's data evaluation will be based on the established multi-laboratory surrogate recovery limits and the National Functional Guidelines, not the laboratory generated recovery limits. The laboratory also failed to re-extract samples with surrogate recoveries that are not within the QA/QC limits as required by the method (page 8270-30 section 8.9.5).

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ANALYSIS

PAGE - 2

Compound Identification /Quantitation

Reject sample 042EW00201RE and 31087MBRE, due to unnecessary analysis due to surrogate recovery evaluation mentioned previously under Contractual Non compliance. Qualify all results as rejected (R).

System Performance and Overall Assessment

The overall system performance was fair. The laboratory did not encounter any large problems. The data reviewer estimates that less than 5% of the data is qualified.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
042EW00201RE 31087MBRE	All analytes	+/-	R

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

CHLORINATED PESTICIDES/PCBs

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8080; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5958

A validation was performed on the Chlorinated Pesticide/PCB Data from SDG L5958. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

System Performance and Overall Assessment

Overall performance as acceptable. The data did not require qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
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NO QUALIFICATIONS WERE REQUIRED.

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

CHLORINATED HERBICIDES

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8150; the National Functional Guidelines for Organic Data Validation, June 1991; and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5958

A validation was performed on the Herbicide Data from SDG L5958. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- * • Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 10% of the data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
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NO QUALIFICATIONS ARE REQUIRED.

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE

ORGANOPHOSPHORUS PESTICIDES

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8140; the National Functional Guidelines for Organic Data Validation, June 1991; and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5958

A validation was performed on the Organophosphorus Pesticide Data from SDG L5958. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- * • Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 10% of the data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
------------------	-------------------	-----------	-----------

NO QUALIFICATIONS ARE REQUIRED.

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE

FUELS - GRO/DRO

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, calibration results, matrix spike recoveries and GC performance. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. SW-846 Method 8015; the National Functional Guidelines for Organic Data Review, where applicable; and EPA DQO Level III requirements. Please refer the specific findings found in each category to the Summary of Data Qualifications table.

SDG# L5958

A validation was performed on the GRO/DRO from SDGs L5958. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • Column Performance
- * • Calibrations
- * • Blanks
- Surrogates
- * • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- * • Identification/Quantitation

* - All criteria were met for this parameter.

Surrogate Recoveries

One (1) sample required qualification due to non-compliant surrogate recoveries.

Specific Finding

The following sample exhibited surrogate recoveries below the QC limit. All positive and non-detect results are qualified as estimated, J/UJ.

042EW00201

DATA ASSESSMENT NARRATIVE FUELS - GRO/DRO

PAGE 2

Overall Performance

Overall performance was acceptable. The data reviewer estimates that less than 5% of the data required qualification..

018A

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

- U = Not detected
- J = Estimated value
- UJ = Reported Quantitation limit is qualified as estimated
- R = Result is rejected and unusable
- D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

- CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.
- U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.
- No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>COMPOUND ID</u>	<u>DL</u>	<u>QL</u>
042EW00201	All compounds	+/-	J/UJ

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE METALS, WET CHEMISTRY AND CYANIDE

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the CLP ILM03.0 Method; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5958

A validation was performed on the Metals Data from SDG L5958. The data was evaluated based on the following parameters.

- * ● Data Completeness
- * ● Holding Times
- * ● Calibrations
- Blanks
- * ● Interferences
- Matrix Spike Recovery
- * ● Matrix Duplicates
- * ● Field Duplicates
- * ● Laboratory Control Samples
- Serial Dilutions
- MSAs

* - All criteria were met for this parameter.

Preparation and Field Blanks

Specific Finding

The preparation blank exhibited contamination for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Iron	21.9 ug/l	no impact
Sodium	133. ug/l	no impact
Zinc	6.33 ug/l	no impact

The USEPA requires that all sample values below five times the preparation, field, DI or calibration blank contamination be qualified as non-detect, "U". The field or DI water blanks exhibited contamination but had no impact on the data.

Matrix Spike Recovery

Specific Finding

The Matrix Spike recovery for waters for Iron was below the lower control limits. All positive and non-detect results are qualified as estimated, "J" or "UJ".

Serial Dilution

Specific Finding

The Serial Dilution for water for Iron and Sodium were outside the control limits. All positive results are qualified as estimated, "J".

MSAs

Specific Finding

The post digestion spike recovery for GFAA was below the lower control limits. All positive and non-detect results for the listed samples below are qualified as estimated, "J" or "UJ".

<u>Element</u>	<u>Sample IDs</u>	<u>% recoveries</u>
Thallium	042EW00201	75

Specific Finding

All sample results left with a "B" qualifier after all other qualifications, will be qualified with a "J" qualifier in place of the "B" per Ensafe's request.

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
all water samples	Fe.	+/-U	J/UJ
all water samples	Fe and Na.	+	J
042EW00201.	Tl.	+/-U	J/UJ
All "B" results	all analytes	B	J



HEARTLAND

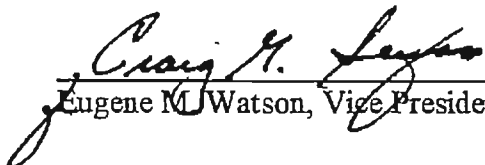
ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: L5959
Date: February 15, 1996
Client Name: Ensafe/Allen & Hoshall
Project/Site Name: Charleston; Zone A
Date Sampled: December 4, 1995
Number of Samples: 2 Aqueous Sample(s) with 2 MS/MSD(s)
Laboratory: Lockheed Analytical Services
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, June 1991 and February, 1994, respectively
QA/QC Level: EPA DQO Level III
Method(s) Utilized: SW846 Third Edition
Analytical Fractions: Volatiles, Semivolatiles, Pesticides w/PCB's, Herbicides, Metals, Cyanide

Analytical data in this report were screened to determine usability of results and also to determine contractual compliance relative to these requirements and deliverables. This screening assumes analytical results are correct as reported and merely provides an interpretation of the reported quality control results. A minimum of 10% of all laboratory calculations have been verified as part of this validation. All instrument output, i.e. spectra, chromatograms, etc., for each sample have been carefully reviewed. The end-user is urged to review the Specific Findings and associated Data Qualifications presented in this report. Annotated Form 1s or spreadsheets for all samples reviewed are included after the Data Assessment Narratives. Form 1s for MS/MSD samples or spreadsheets are not annotated.

The release of this Data Validation Report is authorized by the following signature:


Eugene M. Watson, Vice President

2-21-96
Date

SDG# L5959

Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

ENSAFE ID	MATRIX	VOA		SV		P/P		HERB		TAL		CN	
042TW00201	WATER	X											
042GW00301	WATER	X		X		X		X		X		X	
Total Billable Samples (Water/Soil)		2	0	1	0	1	0	1	0	1	0	1	0

VOA = SW846 Volatiles

SV = SW846 Semivolatiles

P/P = SW846 Pesticide/PCB's

HERB = SW846 Herbicides

TAL = SW846 Metals

CN = SW846 Cyanide

DATA ASSESSMENT NARRATIVES

DATA ASSESSMENT AND NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA 8260; the National Functional Guidelines for Organic Data Review, June 1991, and DQO Level III. All comments made within this report should be considered when examining the analytical results (Form Is).

SDG # L5959

A validation was performed on the Volatile Data from SDG L5959. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibrations
- * • Internal Standard Performance
- Blanks
- * • Surrogate Recoveries
- * • Laboratory Control Samples
- * • Field Duplicates
- * • Compound Identification /Quantitation

* - All criteria were met for this parameter

Contractual Non compliance

The laboratory is not evaluating sample surrogate recoveries based on the multi-laboratory limits found in the SW846 method 8260 on page 8260-28. The laboratory evaluated the sample surrogate recoveries based on their own laboratory generated limits. Heartland ESI's data evaluation will be based on the established multi-laboratory surrogate recovery limits and the National Functional Guidelines, not the laboratory generated recovery limits.

Continuing calibrations

The continuing calibrations that were analyzed with this data package exhibited %Ds and RRFs that were not within continuing calibration criteria.

DATA ASSESSMENT AND NARRATIVE

VOLATILE ANALYSIS

PAGE - 2

Continuing calibrations (continued)

Specific Finding:

The continuing calibration, E0752, contained compounds with %Ds greater than 25%, but less than 50%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J).

042TW00201 chloromethane

The continuing calibration, E0752, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

31101MB trichlorofluoromethane
042TW00201
042GW00301
042GW00301MS
042GW00301MSD

Method Blank

<u>Associated blank</u>	<u>Compound</u>	<u>Concentration</u>
31101MB	acetone	4.6J

<u>Samples</u>	<u>Compound</u>	<u>Qualification</u>
042GW00301	acetone	U
042GW00301MS	acetone	CRQL

System Performance and Overall Assessment

The overall system performance was fair. The laboratory did not encounter any large problems. The data reviewer estimates that less than 5% of the data is qualified.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
042TW00201	chloromethane	+	J
31101MB 042TW00201 042GW00301 042GW00301MS 042GW00301MSD	trichlorofluoromethane	+/-	J/UJ
042GW00301	acetone	+	U
042GW00301MS	acetone	+	CRQL

- * DL denotes the Form I qualifier supplied by the laboratory
 QL denotes the qualifier used by the data validation firm
 + in the DL column denotes a positive result
 - in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

SEMIVOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8270; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5959

A validation was performed on the Semivolatile Data from SDG L5959. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibration
- Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Internal Standard Performance
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Continuing Calibrations

The continuing calibrations standard that was analyzed exhibited a non-compliant %D for one (1) compound which required qualification of the data.

**DATA ASSESSMENT NARRATIVE
SEMIVOLATILE ANALYSIS**

PAGE - 2

Continuing Calibrations, continued

Specific Findings

The continuing calibration standard, S0201002.D contained compounds with %Ds greater than 50 % but less than 90%. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J, and the non-detect results are qualified as estimated, UJ.

042GW00301

4-nitroaniline

Method Blanks

TICs were detected in the method blank. All B flagged TICs in all samples are rejected, R.

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 5 % of data required qualifications

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
042GW00301	4-nitroaniline	+/-	J/UJ

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

CHLORINATED PESTICIDES/PCBs

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8080; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5959

A validation was performed on the Chlorinated Pesticide/PCB Data from SDG L5959. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

System Performance and Overall Assessment

Overall performance as acceptable. The data did not require qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
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No qualifications were required.

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

CHLORINATED HERBICIDES

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8150; the National Functional Guidelines for Organic Data Validation, June 1991; and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5959

A validation was performed on the Herbicide Data from SDG L5959. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- * • Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 10% of the data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
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NO QUALIFICATIONS ARE REQUIRED.

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE METALS AND CYANIDE

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the CLP ILM03.0 Method; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5959

A validation was performed on the Metals Data from SDG L5959. The data was evaluated based on the following parameters.

- * ● Data Completeness
- * ● Holding Times
- * ● Calibrations
- Blanks
- * ● Interferences
- Matrix Spike Recovery
- * ● Matrix Duplicates
- * ● Field Duplicates
- * ● Laboratory Control Samples
- Serial Dilutions
- MSAs

* - All criteria were met for this parameter.

Preparation and Field Blanks

Specific Finding

The preparation blank exhibited contamination for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Iron	21.9 ug/l	no impact
Sodium	133. ug/l	no impact
Zinc	6.33 ug/l	no impact

The field blank exhibited contamination but had no impact on the data.

The USEPA requires that all sample values below five times the preparation, field, DI or calibration blank contamination be qualified as non-detect, "U". The field or DI water blanks exhibited contamination but had no impact on the data.

Matrix Spike Recovery

Specific Finding

The Matrix Spike recovery for waters for Iron was below the lower control limits. All positive and non-detect results are qualified as estimated, "J" or "UJ".

Serial Dilution

Specific Finding

The Serial Dilution for water for Iron and Sodium were outside the control limits. All positive results are qualified as estimated, "J".

MSAs

Specific Finding

The post digestion spike recovery for GFAA was below the lower control limits. All positive and non-detect results for the listed samples below are qualified as estimated, "J" or "UJ".

<u>Element</u>	<u>Sample IDs</u>	<u>% recoveries</u>
Thallium	042GW00301	75

The post digestion spike recovery for GFAA was above the upper control limits. All positive results for the listed samples below are qualified as estimated, "J".

<u>Element</u>	<u>Sample IDs</u>	<u>% recoveries</u>
Thallium	042GW00301	117

Specific Finding

All sample results left with a "B" qualifier after all other qualifications, will be qualified with a "J" qualifier in place of the "B" per Ensaf's request.

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
all water samples	Fe.	+/U	J/UJ
all water samples	Fe and Na.	+	J
042GW00301.	Tl.	+/U	J/UJ
042GW00301.	As.	+	J
All "B" results	all analytes	B	J



HEARTLAND

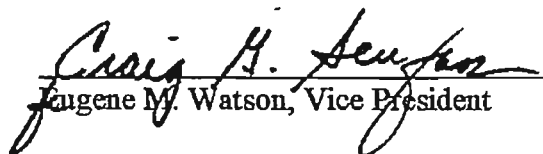
ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: L5970
Date: February 15, 1996
Client Name: Ensafe/Allen & Hoshall
Project/Site Name: Charleston; Zone A
Date Sampled: December 5, 1995
Number of Samples: 7 Aqueous Sample(s) with 2 MS/MSD(s)
Laboratory: Lockheed Analytical Services
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, June 1991 and February, 1994, respectively
QA/QC Level: EPA DQO Level III
Method(s) Utilized: SW846 Third Edition
Analytical Fractions: Volatiles, semivolatiles, pesticides w/PCB's, Herbicides, Petroleum hydrocarbons, Metals, Cyanide

Analytical data in this report were screened to determine usability of results and also to determine contractual compliance relative to these requirements and deliverables. This screening assumes analytical results are correct as reported and merely provides an interpretation of the reported quality control results. A minimum of 10% of all laboratory calculations have been verified as part of this validation. All instrument output, i.e. spectra, chromatograms, etc., for each sample have been carefully reviewed. The end-user is urged to review the Specific Findings and associated Data Qualifications presented in this report. Annotated Form 1s or spreadsheets for all samples reviewed are included after the Data Assessment Narratives. Form 1s for MS/MSD samples or spreadsheets are not annotated.

The release of this Data Validation Report is authorized by the following signature:


Eugene M. Watson, Vice President

2-22-96.
Date

SDG# L5970

Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

ENSAFE ID	MATRIX	VOA	SV	P/P	HERB	TPH	TAL	CN	
039GW00201	WATER	X	X	X		X	X		
039TW00201	WATER	X							
042GW00101	WATER	X	X	X	X		X	X	
042GW00201	WATER	X	X	X	X		X	X	
505GW00101	WATER	X	X	X	X		X	X	
505FW00101	WATER	X	X	X	X		X	X	
GDAGW03D01	WATER								
Total Billable Samples (Water/Soil)		6	0	5	0	5	0	4	0

VOA= SW846 Volatiles

SV= SW846 Semivolatiles

P/P= SW846 Pesticide/PCB's

HERB= SW846 Herbicides

TPH= SW846 Petroleum Hydrocarbons

TAL= SW846 Metals

CN= SW846 Cyanide

DATA ASSESSMENT NARRATIVES

DATA ASSESSMENT NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8260; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5970

A validation was performed on the Volatile Data from SDG L5970. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibration
- Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Internal Standard Performance
- Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Continuing Calibrations

The continuing calibration analyzed exhibited non-compliant %Ds for compounds which required qualification of the data.

**DATA ASSESSMENT NARRATIVE
VOLATILE ANALYSIS**

PAGE - 2

Continuing Calibrations, continued

Specific Findings

The continuing calibration, E0862.D, contained compounds with %Ds greater than 50% but less than 90%. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J. and the non-detect results are qualified as estimated, UJ.

505GW00101	bromomethane
505FW00101	
042GW00101	
042GW00201	
039GW00201	
039TW00201	

The continuing calibration, E0862.D, contained compounds with %Ds greater than 25% but less than 50%. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J.

505GW00101	xylene (total)
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Method Blanks

One of the method blanks exhibited contamination. The samples required qualification.

	31490MB
acetone	4.9 µg/L
trichloroethene	1.8 µg/L
4-methyl-2-pentanone	1.1 µg/L

Specific Finding

<u>Samples</u>	<u>Compound</u>	<u>Qualification</u>
039GW00201	acetone	CRQL
042GW00101		
505GW00101		
042GW00201		U

**DATA ASSESSMENT NARRATIVE
VOLATILE ANALYSIS**

PAGE - 3

Method Blanks, continued

Specific Finding

<u>Samples</u>	<u>Compound</u>	<u>Qualification</u>
042GW00101	trichloroethene	U
042GW00201 505GW00101	trichloroethene	CRQL
505GW00101	4-methyl-2-pentanone	CRQL

Field QC Blanks

The field QC blanks exhibited contamination. The samples required qualification.

	042EW00201	039TW00201	505FW00101
acetone	_____	12 µg/L	6.2 µg/L
chloroform	4.7 µg/L	_____	5.7 µg/L
trichloroethene	_____	_____	2.8 µg/L
4-methyl-2-pentanone	_____	_____	1.6 µg/L
toluene	_____	_____	1.4 µg/L

Specific Finding

	<u>Samples</u>	<u>Compound</u>	<u>Qualification</u>
505FW00101	505GW00101	toluene	CRQL
	505GW00101RE	acetone	CRQL

Compound Identification

The following sample is rejected in favor of the original analysis of the sample.

505GW00101RE

**DATA ASSESSMENT NARRATIVE
VOLATILE ANALYSIS**

PAGE - 4

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 5% of data required qualifications/rejections.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
505GW00101 505FW00101 042GW00101 042GW00201 039GW00201 039TW00201	bromomethane	+/-	J/UJ
505GW00101	xylene (total)	+	J
039GW00201 042GW00101 505GW00101 042GW00201	acetone	+B	CRQL U
042GW00101	trichloroethene	+B	U
042GW00201 505GW00101	trichloroethene	+B	CRQL
505GW00101	4-methyl-2-pentanone	+B	CRQL
505GW00101	toluene	+	CRQL
505GW00101RE	acetone	+	CRQL
505GW00101RE	all compounds	+/-	R

* DL denotes the Form I qualifier supplied by the laboratory
 QL denotes the qualifier used by the data validation firm
 + in the DL column denotes a positive result

- in the DL column denotes a non detect result

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA 8270; National Functional Guidelines for Organic Data Review, and DQO Level III. All comments made within this report should be considered when examining the analytical results (Form I's).

SDG # L5970

A validation was performed on the Semivolatile Data from SDG L5970. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibrations
- * • Internal Standard Performance
- Blanks
- * • Surrogate Recoveries
- * • Laboratory Control Sample
- * • Field Duplicates
- Compound Identification /Quantitation

* - All criteria were met for this parameter

Contractual Non compliance

The laboratory is not evaluating sample surrogate recoveries based on the multi-laboratory limits found in the SW846 method 8270 on page 8270-31. The laboratory evaluated the sample surrogate recoveries based on their own laboratory generated limits. Heartland ESI's data evaluation will be based on the established multi-laboratory surrogate recovery limits and the National Functional Guidelines, not the laboratory generated recovery limits.

Continuing calibrations

The continuing calibrations that were analyzed with this data package exhibited %Ds that were not within %D continuing calibration criteria. All RRFs were within calibration criteria.

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ANALYSIS

PAGE - 2

Continuing calibrations (continued)

Specific Finding:

The continuing calibration, S0501005, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

31242MB	4-nitroaniline
042GW00101	benzoic acid

The continuing calibration, S0201002.D, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

039GW00201	benzoic acid
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The continuing calibration, S0501005, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

505GW00101	4-nitroaniline
505FW00101	benzoic acid
042GW00201	
039GW00201	

Field Blank

<u>Associated blank</u>	<u>Compound</u>	<u>Concentration</u>
505FW00101	bis(2ethylhexyl)phthalate	3.6J
<u>Samples</u>	<u>Compound</u>	<u>Qualification</u>
505GW00101	bis(2ethylhexyl)phthalate	CRQL

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ANALYSIS

PAGE - 3

Compound Identification /Quantitation

Reject sample 039GW00201RE, due to unnecessary analysis due to surrogate recovery evaluation mentioned previously under Contractual Non compliance. Qualify all results as rejected (R).

System Performance and Overall Assessment

The overall system performance was fair. The laboratory did not encounter any large problems. The data reviewer estimates that less than 5% of the data is qualified.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
31242MB 042GW00101	4-nitroaniline benzoic acid	+/-	J/UJ
039GW00201	benzoic acid	+/-	J/UJ
505GW00101 505FW00101 042GW00201 039GW00201	4-nitroaniline benzoic acid	+/-	J/UJ
505GW00101	bis(2ethylhexyl)phthalate	+	CRQL
039GW00201RE	All analytes	+/-	R

- * DL denotes the Form I qualifier supplied by the laboratory
 QL denotes the qualifier used by the data validation firm
 + in the DL column denotes a positive result
 - in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

CHLORINATED PESTICIDES/PCBs

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8080; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5970

A validation was performed on the Chlorinated Pesticide/PCB Data from SDG L5970. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- Calibration
- * • Blanks
- Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Calibrations

The aroclor calibration summary pages for AR1260 were not present in the data package. The appropriate calibration was found in SDG L5959. No qualifications were required. However, a complete data package is required for each SDG.

Surrogate Recoveries

One (1) sample required qualification because of surrogate recoveries below the QC limit.

**DATA ASSESSMENT NARRATIVE
CHLORINATED PESTICIDES/PCBs**

PAGE - 2

Surrogate Recoveries, continued

Specific Finding

The following sample exhibited a DCB recovery below the QC limits. All positive and non-detect results in the sample are qualified as estimated, J/UJ.

039GW00201

System Performance and Overall Assessment

Overall performance as acceptable. The data reviewer estimates that 5 % of data required qualifications/rejections.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
039GW00201	All compounds	+/-	J/UJ

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

CHLORINATED HERBICIDES

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8150; the National Functional Guidelines for Organic Data Validation, June 1991; and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5970

A validation was performed on the Herbicide Data from SDG L5970. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- * • Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 10% of the data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
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NO QUALIFICATIONS ARE REQUIRED.

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE

FUELS - GRO/DRO

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, calibration results, matrix spike recoveries and GC performance. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. SW-846 Method 8015; the National Functional Guidelines for Organic Data Review, where applicable; and EPA DQO Level III requirements. Please refer the specific findings found in each category to the Summary of Data Qualifications table.

SDG# L5970

A validation was performed on the GRO/DRO from SDGs L5970. The data was evaluated based on the following parameters.

- | | | |
|---|---|-------------------------------------|
| * | • | Data Completeness |
| * | • | Holding Times |
| * | • | Column Performance |
| * | • | Calibrations |
| * | • | Blanks |
| * | • | Matrix Spike/Matrix Spike Duplicate |
| * | • | Field Duplicates |
| * | • | Identification/Quantitation |

* - All criteria were met for this parameter.

Overall Performance

Overall performance was acceptable. The data did not require qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

- U** = Not detected
- J** = Estimated value
- UJ** = Reported Quantitation limit is qualified as estimated
- R** = Result is rejected and unusable
- D** = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

- CRQL** = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.
- U** = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.
- No Action** = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>COMPOUND ID</u>	<u>DL</u>	<u>QL</u>
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NO QUALIFICATIONS WERE REQUIRED

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE METALS AND CYANIDE

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the CLP ILM03.0 Method; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5970

A validation was performed on the Metals Data from SDG L5970. The data was evaluated based on the following parameters.

- * ● Data Completeness
- * ● Holding Times
- * ● Calibrations
- Blanks
- * ● Interferences
- Matrix Spike Recovery
- * ● Matrix Duplicates
- * ● Field Duplicates
- * ● Laboratory Control Samples
- Serial Dilutions
- MSAs

* - All criteria were met for this parameter.

Preparation and Field Blanks

Specific Finding

The preparation blank exhibited contamination for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Iron	21.9 ug/l	no impact
Sodium	133. ug/l	no impact
Zinc	6.33 ug/l	042GW00101

The field blank exhibited contamination but had no impact on the data.

The USEPA requires that all sample values below five times the preparation, field, DI or calibration blank contamination be qualified as non-detect, "U". The field or DI water blanks exhibited contamination but had no impact on the data.

Matrix Spike Recovery

Specific Finding

The Matrix Spike recovery for waters for Iron was below the lower control limits. All positive and non-detect results are qualified as estimated, "J" or "UJ".

Serial Dilution

Specific Finding

The Serial Dilution for water for Iron and Sodium were outside the control limits. All positive results are qualified as estimated, "J".

MSAs

Specific Finding

The post digestion spike recovery for GFAA was below the lower control limits. All positive and non-detect results for the listed samples below are qualified as estimated, "J" or "UJ".

<u>Element</u>	<u>Sample IDs</u>	<u>% recoveries</u>
Thallium	039GW00201	83
Thallium	042GW00101	77
Thallium	042GW00201	67
Thallium	505FW00101	83

The post digestion spike recovery for GFAA was above the upper control limits. All positive results for the listed samples below are qualified as estimated, "J".

<u>Element</u>	<u>Sample IDs</u>	<u>% recoveries</u>
Arsenic	042GW00101	128
Arsenic	042GW00201	131
Arsenic	505FW00101	116
Arsenic	505GW00101	136

Specific Finding

All sample results left with a "B" qualifier after all other qualifications, will be qualified with a "J" qualifier in place of the "B" per Ensaf's request.

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
042GW00101	Zn.	+	U
all water samples	Fe.	+/U	J/UJ
all water samples	Fe and Na.	+	J
039GW00201, 042GW00101, 042GW00201 and 505FW00101.	Tl.	+/U	J/UJ
042GW00101, 042GW00201, 505GW00101 and 505FW00101.	As.	+	J
All "B" results	all analytes	B	J



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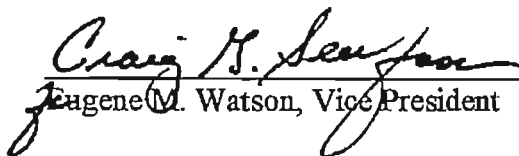
ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: L5991
Date: February 17, 1996
Client Name: Ensafe/ Allen & Hoshall
Project/Site Name: Charleston; Zone A
Date Sampled: December 6, 1995
Number of Samples: 14 Aqueous Sample(s) with 2 MS/MSD(s)
6 Non-aqueous Sample(s) with 0 MS/MSD(s)
Laboratory: Lockheed Analytical Services
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, June 1991 and February, 1994, respectively
QA/QC Level: EPA DQO Level III
Method(s) Utilized: SW846 Third Edition
Analytical Fractions: Volatiles, Semivolatiles, Pesticides/PCB's, Petroleum Hydrocarbons

Analytical data in this report were screened to determine usability of results and also to determine contractual compliance relative to these requirements and deliverables. This screening assumes analytical results are correct as reported and merely provides an interpretation of the reported quality control results. A minimum of 10% of all laboratory calculations have been verified as part of this validation. All instrument output, i.e. spectra, chromatograms, etc., for each sample have been carefully reviewed. The end-user is urged to review the Specific Findings and associated Data Qualifications presented in this report. Annotated Form 1s or spreadsheets for all samples reviewed are included after the Data Assessment Narratives. Form 1s for MS/MSD samples or spreadsheets are not annotated.

The release of this Data Validation Report is authorized by the following signature:


Eugene M. Watson, Vice President

2-22-96.
Date

SDG# L5991

Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

ENSAFE ID	MATRIX	VOA	SV	P/P	TPH				
039FP00501	WATER	X							
039FP00510	SOIL	X							
039FP00511	SOIL	X							
039FP005512	WATER	X							
039FP00513	SOIL	X							
039FP00521	WATER	X							
039FP00531	WATER	X							
039FP00541	SOIL	X							
039FP00551	WATER	X							
039FP00561	SOIL	X							
039FP00571	WATER	X							
039FP00581	SOIL	X							
039FP00591	WATER	X							
039GW00101	WATER	X	X	X	X				
039TW00101	WATER	X							
039GW00301	WATER	X	X	X	X				
039GW00401	WATER	X	X	X	X				
039GW00501	WATER	X	X	X	X				
039GW04D01	WATER	X	X	X	X				
039GW03D01	WATER								
Total Billable Samples (Water/Soil)		13	6	5	0	5	0	5	0

VOA= SW846 Volatiles

SV= SW846 Semivolatiles

P/P= SW846 Pesticide/PCB's

TPH= SW846 Petroleum hydrocarbons

DATA ASSESSMENT NARRATIVES

DATA ASSESSMENT NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8260; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5991

A validation was performed on the Volatile Data from SDG L5991. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibration
- Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- Internal Standard Performance
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Continuing Calibrations

The continuing calibration analyzed exhibited non-compliant %Ds for compounds which required qualification of the data.

**DATA ASSESSMENT NARRATIVE
VOLATILE ANALYSIS**

PAGE - 2

Continuing Calibrations, continued

Specific Findings

The continuing calibration, I1258.D, contained compounds with %Ds greater than 50% but less than 90%. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J. and the non-detect results are qualified as estimated, UJ.

039GW00101	bromomethane
039GW00301	

Internal Standard Recoveries

One (1) sample exhibited non-compliant internal standard recoveries.

Specific Finding

The following sample exhibited internal standard recoveries below the QC limits. All compounds associated with the non-compliant internal standard(s) are qualified as estimated, J/UJ.

039FP00541	pentafluorobenzene
	1,4-dichlorobenzene-d ₄

Method Blanks

Two (2) of the method blanks exhibited contamination. The samples required qualification.

	31508MB	31514MB
acetone	—	5.4 µg/L
4-methyl-2-pentanone	—	1.1 µg/L
2-butanone	2.4 µg/L	—

**DATA ASSESSMENT NARRATIVE
VOLATILE ANALYSIS**

PAGE - 3

Method Blanks, continued

Specific Finding

<u>Samples</u>	<u>Compound</u>	<u>Qualification</u>
039GW00401 039GW04D01	acetone	CRQL
039GW00401	4-methyl-2-pentanone	CRQL
039FP00511 039FP00541 039FP00561 039FP00581 039FP00510 039FP00513	2-butanone	CRQL

Field QC Blanks

The field QC blanks exhibited contamination. The samples required qualification.

	042EW00201	039TW00101	505FW00101
acetone	_____	_____	6.2 µg/L
chloroform	4.7 µg/L	_____	5.7 µg/L
trichloroethene	_____	_____	2.8 µg/L
4-methyl-2-pentanone	_____	_____	1.6 µg/L
toluene	_____	_____	1.4 µg/L

Specific Finding

	<u>Samples</u>	<u>Compound</u>	<u>Qualification</u>
042EW00201	039GW04D01	chloroform	U

**DATA ASSESSMENT NARRATIVE
VOLATILE ANALYSIS**

PAGE - 4

Field QC Blanks, continued

Specific Finding

	<u>Samples</u>	<u>Compound</u>	<u>Qualification</u>
505FW00101	039FP00501 039FP00521 039FP00571 039GW00101	acetone	CRQL
	039FP00512 039FP00513 039FP00541	acetone	U
	039FP00521 039GW00101	toluene	CRQL
	039GW00401	trichloroethene	CRQL

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 5% of data required qualifications/rejections.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
039GW00101 039GW00301	bromomethane	+/-	J/UJ
039FP00541	All associated with pentafluorobenzene & 1,4-dichlorobenzene-d ₄	+/-	J/UJ
039GW00401 039GW04D01	acetone	+B	CRQL
039GW00401	4-methyl-2-pentanone	+B	CRQL
039FP00511 039FP00541 039FP00561 039FP00581 039FP00510 039FP00513	2-butanone	+B	CRQL
039GW04D01	chloroform	+	U
039FP00501 039FP00521 039FP00571 039GW00101	acetone	+	CRQL
039FP00512 039FP00513 039FP00541	acetone	+	U
039FP00521 039GW00101	toluene	+	CRQL
039GW00401	trichloroethene	+	CRQL

SUMMARY OF DATA QUALIFICATIONS

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA 8270; National Functional Guidelines for Organic Data Review, and DQO Level III. All comments made within this report should be considered when examining the analytical results (Form I's).

SDG # L5991

A validation was performed on the Semivolatile Data from SDG L5991. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibrations
- * • Internal Standard Performance
- Blanks
- * • Surrogate Recoveries
- * • Laboratory Control Sample
- * • Field Duplicates
- Compound Identification /Quantitation

* - All criteria were met for this parameter

Contractual Non compliance

The laboratory is not evaluating sample surrogate recoveries based on the multi-laboratory limits found in the SW846 method 8270 on page 8270-31. The laboratory evaluated the sample surrogate recoveries based on their own laboratory generated limits. Heartland ESI's data evaluation will be based on the established multi-laboratory surrogate recovery limits and the National Functional Guidelines, not the laboratory generated recovery limits. Laboratory also failed to re-extract samples with surrogate recoveries that are not with the QA/QC limits as required by the method (page 8270-30 section 8.9.5).

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ANALYSIS

PAGE - 2

Continuing calibrations

The continuing calibrations that were analyzed with this data package exhibited %Ds that were not within %D continuing calibration criteria. All RRFs were within calibration criteria.

Specific Finding:

The continuing calibration, S0501005, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

31242MB	4-nitroaniline benzoic acid
---------	--------------------------------

The continuing calibration, S0201002.D, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

039GW00101	benzoic acid
039GW00501	
039GW00401	
039GW04D01	
039GW00301	

Field Blank

<u>Associated blank</u>	<u>Compound</u>	<u>Concentration</u>
505FW00101	bis(2ethylhexyl)phthalate	3.6J
<u>Samples</u>	<u>Compound</u>	<u>Qualification</u>
039GW00401	bis(2ethylhexyl)phthalate	CRQL

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ANALYSIS

PAGE - 3

Compound Identification /Quantitation

Reject sample 039GW00401RE, due to surrogate non compliance. Qualify all results as reject (R).

System Performance and Overall Assessment

The overall system performance was fair. The laboratory did not encounter any large problems. The data reviewer estimates that less than 5% of the data is qualified.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
31242MB	4-nitroaniline benzoic acid	+/-	J/UJ
039GW00101 039GW00501 039GW00401 039GW04D01 039GW00301	benzoic acid	+/-	J/UJ
039GW00401	bis(2ethylhexyl)phthalate	+	CRQL
039GW00401RE	All analytes	+/-	R

- * DL denotes the Form I qualifier supplied by the laboratory
 QL denotes the qualifier used by the data validation firm
 + in the DL column denotes a positive result
 - in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

CHLORINATED PESTICIDES/PCBs

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8080; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5991

A validation was performed on the Chlorinated Pesticide/PCB Data from SDG L5991. The data was evaluated based on the following parameters:

- | | | |
|---|---|--------------------------------------|
| * | • | Data Completeness |
| * | • | Holding Times |
| | • | Calibration |
| * | • | Blanks |
| | • | Surrogate Recoveries |
| * | • | Matrix Spike/Matrix Spike Duplicates |
| * | • | Field Duplicates |
| * | • | Compound Identification |
| * | • | Compound Quantitation |

* - All criteria were met for this parameter.

Calibrations

The aroclor calibration summary pages for AR1260 were not present in the data package. The appropriate calibration was found in SDG L5959. No qualifications were required. However, a complete data package is required for each SDG.

Surrogate Recoveries

One (1) sample required qualification because of surrogate recoveries below the QC limit.

**DATA ASSESSMENT NARRATIVE
CHLORINATED PESTICIDES/PCBs**

PAGE - 2

Surrogate Recoveries, continued

Specific Finding

The following sample exhibited a DCB recovery below the QC limits. All positive and non-detect results in the sample are qualified as estimated, J/UJ.

039GW00401

System Performance and Overall Assessment

Overall performance as acceptable. The data reviewer estimates that 5% of data required qualifications/rejections.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
039GW00401	All compounds	+/-	J/UJ

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

FUELS - GRO/DRO

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, calibration results, matrix spike recoveries and GC performance. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. SW-846 Method 8015; the National Functional Guidelines for Organic Data Review, where applicable; and EPA DQO Level III requirements. Please refer the specific findings found in each category to the Summary of Data Qualifications table.

SDG# L5991

A validation was performed on the GRO/DRO from SDGs L5991. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • Column Performance
- * • Calibrations
- * • Blanks
- Surrogates
- * • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- * • Identification/Quantitation

* - All criteria were met for this parameter.

Surrogate Recoveries

One (1) sample required qualification due to non-compliant surrogate recoveries.

Specific Finding

The following sample exhibited surrogate recoveries below the QC limit. All positive and non-detect results are qualified as estimated, J/UJ.

039GW00501

DATA ASSESSMENT NARRATIVE FUELS - GRO/DRO

PAGE 2

Overall Performance

Overall performance was acceptable. The data reviewer estimates that less than 5% of the data required qualification.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

- U** = Not detected
- J** = Estimated value
- UJ** = Reported Quantitation limit is qualified as estimated
- R** = Result is rejected and unusable
- D** = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

- CRQL =** The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.
- U =** The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.
- No Action =** The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>COMPOUND ID</u>	<u>DL</u>	<u>QL</u>
039GW00501	All compounds	+/-	J/UJ

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result



HEARTLAND

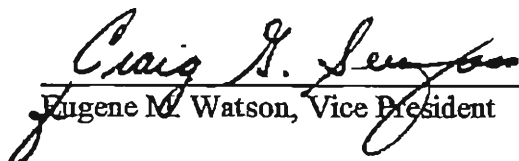
ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: L5992
Date: February 15, 1996
Client Name: Ensafe/Allen & Hoshall
Project/Site Name: Charleston; Zone A
Date Sampled: December 6, 1995
Number of Samples: 1 Aqueous Sample(s) with 1 MS/MSD(s)
Laboratory: Lockheed Analytical Services
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, June 1991 and February, 1994, respectively
QA/QC Level: EPA DQO Level IV
Method(s) Utilized: SW846 Third Edition
Analytical Fractions: Volatiles, Semivolatiles, Pesticides w/PCB's, Herbicides, Organophosphorus Pesticides, Petroleum Hydrocarbons, Dissolved Solids, Chlorides, Sulfates, hexavalent Chromium, Metals, Cyanide

Analytical data in this report were screened to determine usability of results and also to determine contractual compliance relative to these requirements and deliverables. This screening assumes analytical results are correct as reported and merely provides an interpretation of the reported quality control results. A minimum of 10% of all laboratory calculations have been verified as part of this validation. All instrument output, i.e. spectra, chromatograms, etc., for each sample have been carefully reviewed. The end-user is urged to review the Specific Findings and associated Data Qualifications presented in this report. Annotated Form 1s or spreadsheets for all samples reviewed are included after the Data Assessment Narratives. Form 1s for MS/MSD samples or spreadsheets are not annotated.

The release of this Data Validation Report is authorized by the following signature:


Eugene M. Watson, Vice President

2-22-96.
Date

SDG# L5992

Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

ENSAFE ID	MATRIX	VOA	SV	P/P	HERB	OPP	TPH	TDS	CHL	SUL	HCR	TAL	CN
039HW00301	WATER	X	X	X	X	X	X	X	X	X	X	X	X
Total Billable Samples (Water/Soil)		1 0	1 0	1 0	1 0	1 0	1 0	1 0	1 0	1 0	1 0	1 0	1 0

VOA = SW846 Volatiles

SV = SW846 Semivolatiles

P/P = SW846 Pesticide/PCB's

HERB = SW846 Herbicides

OPP = SW846 Organophosphorus Pesticides

TPH = SW846 Petroleum Hydrocarbons

TDS = SW846 Dissolved Solids

CHL = SW846 Chlorides

SUL = SW846 Sulfates

HCR = SW846 Hexavalent Chromium

TAL = SW846 Metals

CN = SW846 Cyanide

DATA ASSESSMENT NARRATIVES

DATA ASSESSMENT NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8260; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5992

A validation was performed on the Volatile Data from SDG L5992. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibration
- Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Internal Standard Performance
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Initial Calibration

The target compound chloroprene was calibrated as a single point with the BFB tune injection. The compound was not present in the ICAL or CCAL standards.

Specific Findings

The following compound is rejected in all samples due to an invalid calibration.

All samples

Chloroprene

**DATA ASSESSMENT NARRATIVE
VOLATILE ANALYSIS**

PAGE - 2

Continuing Calibrations

The continuing calibration analyzed exhibited non-compliant %Ds and RRFs for compounds which required qualification of the data.

Specific Findings

The continuing calibration, E0814.D, contained compounds with %Ds greater than 50% but less than 90%. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J. and the non-detect results are qualified as estimated, UJ.

039HW00301 chloroethane

The continuing calibration, E0814.D, contained compounds with RRFs less than 0.05 or %Ds greater than 90%. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J. and the non-detect results are rejected, R.

039HW00301 acetonitrile
 1,4-dioxane

Method Blanks

The method blank exhibited contamination for acetone and acetonitrile. The sample required qualification.

	31380MB
acetone	5.1 µg/L
acetonitrile	53 µg/L

Specific Finding

<u>Samples</u>	<u>Compound</u>	<u>Qualification</u>
039HW00301	acetone	CRQL

**DATA ASSESSMENT NARRATIVE
VOLATILE ANALYSIS**

PAGE - 3

System Performance and Overall Assessment

Overall performance was acceptable with the exception of the compound chloroprene. The data reviewer estimates less than 5 % of data required qualifications/rejections.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
All samples	Chloroprene	+/-	J/R
039HW00301	chloroethane	+/-	J/UJ
039HW00301	acetonitrile 1,4-dioxane	+/-	J/R
039HW00301	acetone	+B	CRQL

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA 8270 Appendix IX; National Functional Guidelines for Organic Data Review, and DQO Level IV. All comments made within this report should be considered when examining the analytical results (Form I's).

SDG # L5992

A validation was performed on the Semivolatile Data from SDG L5992. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- * • Calibrations
- * • Internal Standard Performance
- * • Blanks
- * • Surrogate Recoveries
- * • Laboratory Control Sample
- * • Field Duplicates
- * • Compound Identification /Quantitation

* - All criteria were met for this parameter

Contractual Non compliance

The laboratory is not evaluating sample surrogate recoveries based on the multi-laboratory limits found in the SW846 method 8270 on page 8270-31. The laboratory evaluated the sample surrogate recoveries based on their own laboratory generated limits. Heartland ESI's data evaluation will be based on the established multi-laboratory surrogate recovery limits and the National Functional Guidelines, not the laboratory generated recovery limits.

System Performance and Overall Assessment

The overall system performance was fair. The laboratory did not encounter any large problems. The data reviewer estimates that none of this data requires qualification.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCLORS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8080; the National Functional Guidelines for Organic Data Validation, June 1991; and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5992

A validation was performed on the Pesticide/Aroclor Data from SDG L5992. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- * • Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Contractual Non-Compliance

The method requires that all target compounds, including the multi-component compounds, be analyzed with a five (5) point calibration curve. The laboratory analyzed a single point curve for the Aroclors 1221, 1232, 1242, 1248, and 1254, Toxaphene, and Chlordane. The data did not require qualification because no positive results were reported for the compounds analyzed with a single point calibration.

DATA ASSESSMENT NARRATIVE

PESTICIDE/AROCOR ANALYSIS

PAGE - 2

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 10% of the data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

SAMPLE ID

ANALYTE ID

DL

QL

NO QUALIFICATIONS ARE REQUIRED.

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE

ORGANOPHOSPHOROUS PESTICIDES

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8140; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5992

A validation was performed on the Organophosphorous Pesticide Data from SDG L5992. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Initial Calibrations

The initial calibrations that were analyzed by the laboratory for these samples were not acceptable for all compound correlation coefficients.

**DATA ASSESSMENT NARRATIVE
ORGANOPHOSPHOROUS PESTICIDES**

PAGE - 2

Initial Calibrations, continued

Specific Findings

The initial calibration on 12/17/95, contained compounds with correlation coefficients less than 0.990 but greater than 0.850. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J, and the non-detect results are qualified as estimated, UJ.

039HW00301 dimethoate

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates that 5 % of data required qualifications/rejections.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
03HW00301	dimethoate	+/-	J/UJ

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

CHLORINATED HERBICIDES

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8150; the National Functional Guidelines for Organic Data Validation, June 1991; and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5992

A validation was performed on the Herbicide Data from SDG L5992. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- * • Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 10% of the data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
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NO QUALIFICATIONS ARE REQUIRED.

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE

FUELS - GRO/DRO

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, calibration results, matrix spike recoveries and GC performance. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. SW-846 Method 8015; the National Functional Guidelines for Organic Data Review, where applicable; and EPA DQO Level III requirements. Please refer the specific findings found in each category to the Summary of Data Qualifications table.

SDG# L5992

A validation was performed on the GRO/DRO from SDGs L5992. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • Column Performance
- * • Calibrations
- * • Blanks
- * • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- * • Identification/Quantitation

* - All criteria were met for this parameter.

Overall Performance

Overall performance was acceptable. The data did not require qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

- U = Not detected
- J = Estimated value
- UJ = Reported Quantitation limit is qualified as estimated
- R = Result is rejected and unusable
- D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

- CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.
- U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.
- No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>COMPOUND ID</u>	<u>DL</u>	<u>QL</u>
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NO QUALIFICATIONS WERE REQUIRED

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE METALS, WET CHEMISTRY AND CYANIDE

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the CLP ILM03.0 Method; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5992

A validation was performed on the Metals Data from SDG L5992. The data was evaluated based on the following parameters.

- * ● Data Completeness
- * ● Holding Times
- * ● Calibrations
- Blanks
- * ● Interferences
- Matrix Spike Recovery
- * ● Matrix Duplicates
- * ● Field Duplicates
- * ● Laboratory Control Samples
- Serial Dilutions
- MSAs

* - All criteria were met for this parameter.

Preparation and Field Blanks

Specific Finding

The preparation blank exhibited contamination for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Iron	21.9 ug/l	no impact
Sodium	133. ug/l	no impact
Zinc	6.33 ug/l	039HW00301

The USEPA requires that all sample values below five times the preparation, field, DI or calibration blank contamination be qualified as non-detect, "U". The field or DI water blanks exhibited contamination but had no impact on the data.

Matrix Spike Recovery

Specific Finding

The Matrix Spike recovery for waters for Iron was below the lower control limits. All positive and non-detect results are qualified as estimated, "J" or "UJ".

Serial Dilution

Specific Finding

The Serial Dilution for water for Iron and Sodium were outside the control limits. All positive results are qualified as estimated, "J".

MSAs

Specific Finding

The post digestion spike recovery for GFAA was below the lower control limits. All positive and non-detect results for the listed samples below are qualified as estimated, "J" or "UJ".

<u>Element</u>	<u>Sample IDs</u>	<u>% recoveries</u>
Thallium	039HW00301	75

Specific Finding

All sample results left with a "B" qualifier after all other qualifications, will be qualified with a "J" qualifier in place of the "B" per Ensafe's request.

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
039HW01D01	Zn.	+	U
all water samples	Fe.	+ / U	J / UJ
all water samples	Fe and Na.	+	J
039HW00301.	Tl.	+ / U	J / UJ
All "B" results	all analytes	B	J



HEARTLAND

ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: L5991W & L6024W
Date: February 2, 1996
Client Name: Ensafe/Allen & Hoshall
Project/Site Name: Charleston; Zone A
Date Sampled: December 6 - 12, 1995
Number of Samples: 16 Aqueous Sample(s) with 1 MS/MSD(s)
Laboratory: Lockheed Analytical Services
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, June 1991 and February, 1994, respectively
QA/QC Level: EPA DQO Level III
Method(s) Utilized: CLP Multimedia SOW
Analytical Fractions: Metals

Analytical data in this report were screened to determine usability of results and also to determine contractual compliance relative to these requirements and deliverables. This screening assumes analytical results are correct as reported and merely provides an interpretation of the reported quality control results. A minimum of 10% of all laboratory calculations have been verified as part of this validation. All instrument output, i.e. spectra, chromatograms, etc., for each sample have been carefully reviewed. The end-user is urged to review the Specific Findings and associated Data Qualifications presented in this report. Annotated Form 1s or spreadsheets for all samples reviewed are included after the Data Assessment Narratives. Form 1s for MS/MSD samples or spreadsheets are not annotated.

The release of this Data Validation Report is authorized by the following signature:

for Kimberly S. Shopp
Eugene M. Watson, Vice President

2/2/96
Date

SDG# L5991W & L6024W

Samples and Fractions Reviewed

Sample Identifications Analytical Fractions

ENSAFE ID	MATRIX	TAL	
GDBEW00301	WATER	X	
GDBGW00101	WATER	X	
GDBGW00201	WATER	X	
GDBGW00301	WATER	X	
GDBGW00401	WATER	X	
GDBGW01D01	WATER	X	
GDBGW04D01	WATER	X	
039GW00101	WATER	X	
039GW00301	WATER	X	
039GW00401	WATER	X	
039GW00501	WATER	X	
039GW04D01	WATER	X	
042EW00201MS	WATER	X	
042EW00201MSD	WATER	X	
Total Billable Samples (Water/Soil)		14	0

TAL= CLP Metals

DATA ASSESSMENT NARRATIVES

DATA ASSESSMENT NARRATIVE METALS, CYANIDE AND WET CHEMISTRY

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the CLP ILM03.0 Method; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5991W

A validation was performed on the Metals and wet chemistry Data from SDG L5991W. The data was evaluated based on the following parameters.

- * ● Data Completeness
- * ● Holding Times
- * ● Calibrations
- Blanks
- * ● Interferences
- Matrix Spike Recovery
- * ● Matrix Duplicates
- * ● Field Duplicates
- * ● Laboratory Control Samples
- Serial Dilutions
- MSAs

* - All criteria were met for this parameter.

Preparation and Field Blanks

Specific Finding

The preparation blank exhibited contamination for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Iron	21.9 ug/l	no impact
Sodium	133. ug/l	no impact
Zinc	6.33 ug/l	all samples below 31.7 ug/l

The USEPA requires that all sample values below five times the preparation, field, DI or calibration blank contamination be qualified as non-detect, "U". The field or DI water blanks exhibited contamination but had no impact on the data.

Matrix Spike Recovery

Specific Finding

The Matrix Spike recovery for waters for Iron was below the lower control limits. All positive and non-detect results are qualified as estimated, "J" or "UJ".

Serial Dilution

Specific Finding

The Serial Dilutions for waters for Iron and Sodium were outside the control limits. All positive results are qualified as estimated, "J".

MSAs

Specific Finding

The post digestion spike recovery for GFAA was below the lower control limits. All positive and non-detect results for the listed samples below are qualified as estimated, "J" or "UJ".

<u>Element</u>	<u>Sample IDs</u>	<u>% recoveries</u>
Thallium	039GW00301	74
Thallium	039GW00501	84
Thallium	039GW00401	84
Thallium	039GW04D01	84

Specific Finding

The post digestion spike recovery for GFAA was above the upper control limits. All positive results for the listed samples below are qualified as estimated, "J".

<u>Element</u>	<u>Sample IDs</u>	<u>% recoveries</u>
Arsenic	039GW00301	116
Arsenic	039GW00501	118

Specific Finding

All sample results left with a "B" qualifier after all other qualifications, will be qualified with a "J" qualifier in place of the "B" per Ensafe's request.

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
All water samples	Zn.	+	J
All water samples	Fe.	+ / U	J / UJ
All water samples	Fe and Na.	+	J
039GW00301 and 501.	As.	+	J
039GW00301, 501, 401 and 04D01.	Tl.		
All "B" results	all analytes	B	J

DATA ASSESSMENT NARRATIVE METALS, CYANIDE AND WET CHEMISTRY

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the CLP ILM03.0 Method; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L6024W

A validation was performed on the Metals and wet chemistry Data from SDG L6024. The data was evaluated based on the following parameters.

- * ● Data Completeness
- * ● Holding Times
- * ● Calibrations
- Blanks
- * ● Interferences
- Matrix Spike Recovery
- * ● Matrix Duplicates
- * ● Field Duplicates
- * ● Laboratory Control Samples
- Serial Dilutions
- MSAs

* - All criteria were met for this parameter.

Preparation and Field Blanks

Specific Finding

The preparation blank exhibited contamination for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Calcium	29.4 ug/l	all samples below 147. ug/l
Iron	16.1 ug/l	all samples below 80.5 ug/l
Sodium	162. ug/l	no impact

The USEPA requires that all sample values below five times the preparation, field, DI or calibration blank contamination be qualified as non-detect, "U". The field or DI water blanks exhibited contamination but had no impact on the data.

Matrix Spike Recovery

Specific Finding

The Matrix Spike recovery for waters for Selenium was above the upper control limits. All positive results are qualified as estimated, "J".

Serial Dilution

Specific Finding

The Serial Dilutions for waters for Calcium, Magnesium and Sodium were outside the control limits. All positive results are qualified as estimated, "J".

MSAs

Specific Finding

The post digestion spike recovery for GFAA was below the lower control limits. All positive and non-detect results for the listed samples below are qualified as estimated, "J" or "UJ".

<u>Element</u>	<u>Sample IDs</u>	<u>% recoveries</u>
Lead	GDBGW00101	67
Lead	GDBGW01D01	60
Selenium	GDBGW00101	64
Selenium	GDBGW00201	61
Selenium	GDBGW00301	78
Selenium	GDBGW01D01	63
Thallium	GDBGW00101	53
Thallium	GDBGW00201	56
Thallium	GDBGW00301	66
Thallium	GDBGW01D01	55
Thallium	GDBEW00301	36

Specific Finding

The post digestion spike recovery for GFAA was above the upper control limits. All positive results for the listed samples below are qualified as estimated, "J".

<u>Element</u>	<u>Sample IDs</u>	<u>% recoveries</u>
Arsenic	GDBGW00101	118
Arsenic	GDBGW00301	120
Arsenic	GDBGW01D01	123

Specific Finding

All sample results left with a "B" qualifier after all other qualifications, will be qualified with a "J" qualifier in place of the "B" per Ensafe's request.

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
all samples below 80.5 ug/l	Fe.	+	U
all samples below 147. ug/l	Ca.		
all samples	Se.	+	J
all samples	Ca, Mg and Na.	+	J
GDBGW00101, 301 and 01D01.	As.	+	J
GDBGW00101 and 01D01.	Pb.	+/U	J/UJ
GDBGW00101, 201, 301 and 01D01.	Se.		
GDBGW00101, 201, 301, 01D01 and GDBEW00301.	Tl.		
All "B" results	all analytes	B	J



HEARTLAND

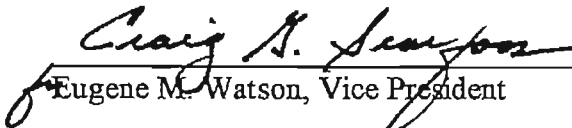
ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: L5997
Date: February 15, 1996
Client Name: Ensafe/Allen & Hoshall
Project/Site Name: Charleston; Zone A
Date Sampled: December 7 - 10, 1995
Number of Samples: 8 Aqueous Sample(s) with 2 MS/MSD(s)
Laboratory: Lockheed Analytical Services
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, June 1991 and February, 1994, respectively
QA/QC Level: EPA DQO Level III
Method(s) Utilized: SW846 Third Edition
Analytical Fractions: Volatiles, Semivolatiles, Pesticides w/PCB's, Petroleum Hydrocarbons, Dissolved Solids, Chlorides, Sulfates, Metals, Cyanide

Analytical data in this report were screened to determine usability of results and also to determine contractual compliance relative to these requirements and deliverables. This screening assumes analytical results are correct as reported and merely provides an interpretation of the reported quality control results. A minimum of 10% of all laboratory calculations have been verified as part of this validation. All instrument output, i.e. spectra, chromatograms, etc., for each sample have been carefully reviewed. The end-user is urged to review the Specific Findings and associated Data Qualifications presented in this report. Annotated Form 1s or spreadsheets for all samples reviewed are included after the Data Assessment Narratives. Form 1s for MS/MSD samples or spreadsheets are not annotated.

The release of this Data Validation Report is authorized by the following signature:


Eugene M. Watson, Vice President

2-22-96
Date

SDG# L5997

Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

ENSAFE ID	MATRIX	VOA	SV	P/P	TPH	TDS	CHL	SUL	TAL	CN									
038GW00101	WATER	X	X	X	X				X										
038GW00201	WATER	X	X	X	X				X										
038GW01D01	WATER	X	X	X	X	X	X	X	X										
506GW00101	WATER	X	X						X										
GDAGW00101	WATER	X	X	X					X	X									
GDATW00101	WATER	X																	
GDAGW01D01	WATER	X	X	X		X	X	X	X	X									
GDAGW03D01	WATER		X	X															
Total Billable Samples (Water/Soil)		7	0	7	0	6	0	3	0	2	0	2	0	2	0	6	0	2	0

VOA = SW846 Volatiles

SV = SW846 Semivolatiles

P/P = SW846 Pesticide/PCB's

TPH = SW846 Petroleum Hydrocarbons

TDS = SW846 Dissolved Solids

CHL = SW846 Chlorides

SUL = SW846 Sulfates

TAL = SW846 Metals

CN = SW846 Cyanide

DATA ASSESSMENT NARRATIVES

DATA ASSESSMENT NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8260; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5997

A validation was performed on the Volatile Data from SDG L5997. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibration
- Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Internal Standard Performance
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Continuing Calibrations

The continuing calibration analyzed exhibited non-compliant %Ds for compounds which required qualification of the data.

**DATA ASSESSMENT NARRATIVE
VOLATILE ANALYSIS**

PAGE - 2

Continuing Calibrations, continued

Specific Findings

The continuing calibration, I1258.D, contained compounds with %Ds greater than 50% but less than 90%. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J. and the non-detect results are qualified as estimated, UJ.

506GW00101	bromomethane
GDAGW01D01	

Method Blanks

One of the method blanks exhibited contamination. The samples required qualification.

	31514MB
acetone	5.4 µg/L
4-methyl-2-pentanone	1.1 µg/L

Specific Finding

<u>Samples</u>	<u>Compound</u>	<u>Qualification</u>
038GW01D01 GDAGW00101	acetone	CRQL

DATA ASSESSMENT NARRATIVE VOLATILE ANALYSIS

PAGE - 3

Field QC Blanks

The field QC blanks exhibited contamination. The samples required qualification.

	042EW00201	039TW00201	505FW00101
acetone	_____	_____	6.2 µg/L
chloroform	4.7 µg/L	_____	5.7 µg/L
trichloroethene	_____	_____	2.8 µg/L
4-methyl-2-pentanone	_____	_____	1.6 µg/L
toluene	_____	_____	1.4 µg/L

Specific Finding

	<u>Samples</u>	<u>Compound</u>	<u>Qualification</u>
505FW00101	GDAGW01D01	acetone	U
	506GW00101	acetone	CRQL
	GDAGW01D01 038GW01D01	chloroform	U

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 5 % of data required qualifications/rejections.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
506GW00101 GDAGW01D01	bromomethane	+/-	J/UJ
038GW01D01 GDAGW00101	acetone	+B	CRQL
GDAGW01D01	acetone	+	U
506GW00101	acetone	+	CRQL
GDAGW01D01 038GW01D01	chloroform	+	U

- * DL denotes the Form I qualifier supplied by the laboratory
 QL denotes the qualifier used by the data validation firm
 + in the DL column denotes a positive result
 - in the DL column denotes a non detect result

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA 8270; National Functional Guidelines for Organic Data Review, and DQO Level III. All comments made within this report should be considered when examining the analytical results (Form I's).

SDG # L5997

A validation was performed on the Semivolatile Data from SDG L5997. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibrations
- * • Internal Standard Performance
- Blanks
- * • Surrogate Recoveries
- * • Laboratory Control Sample
- * • Field Duplicates
- Compound Identification /Quantitation

* - All criteria were met for this parameter

Contractual Non compliance

The laboratory is not evaluating sample surrogate recoveries based on the multi-laboratory limits found in the SW846 method 8270 on page 8270-31. The laboratory evaluated the sample surrogate recoveries based on their own laboratory generated limits. Heartland ESI's data evaluation will be based on the established multi-laboratory surrogate recovery limits and the National Functional Guidelines, not the laboratory generated recovery limits. The laboratory also failed to re-extract samples with surrogate recoveries generated recoveries that are not within the QA/QC limits as required by the method (page 8270-30 section 8.9.5).

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ANALYSIS

PAGE - 2

Continuing calibrations

The continuing calibrations that were analyzed with this data package exhibited %Ds that were not within %D continuing calibration criteria. All RRFs were within calibration criteria.

Specific Finding:

The continuing calibration, S0501005, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

31457MB	4-nitroaniline
038GW00101	benzoic acid
038GW01D01	
038GW00201	
506GW00101	
GDAGW00101	
GDAGW03D01	
GDAGW03D01MS	
GDAGW03D01MSD	

The continuing calibration, S0201002.D, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

038GW01D01RE	benzoic acid
GDAGW01D01	

Method Blank

<u>Associated blank</u>	<u>Compound</u>	<u>Concentration</u>
31457MB	bis(2ethylhexyl)phthalate	4.6J
<u>Samples</u>	<u>Compound</u>	<u>Qualification</u>
038GW00101	bis(2ethylhexyl)phthalate	CRQL

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ANALYSIS

PAGE - 3

Compound Identification /Quantitation

Reject sample, 038GW01D01RE due to non compliant surrogate recoveries. Qualify all results as reject (R).

System Performance and Overall Assessment

The overall system performance was fair. The laboratory did not encounter any large problems. The data reviewer estimates that less than 5% of the data is qualified.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
31457MB	4-nitroaniline	+/-	J/UJ
038GW00101	benzoic acid		
038GW01D01			
038GW00201			
506GW00101			
GDAGW00101			
GDAGW03D01			
GDAGW03D01MS			
GDAGW03D01MSD			
038GW01D01RE	benzoic acid	+/-	J/UJ
GDAGW01D01			
038GW00101	bis(2ethylhexyl)phthalate	+	CRQL
038GW01D01RE	All analytes	+/-	R

- * DL denotes the Form I qualifier supplied by the laboratory
 QL denotes the qualifier used by the data validation firm
 + in the DL column denotes a positive result
 - in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

CHLORINATED PESTICIDES/PCBs

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8080; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5997

A validation was performed on the Chlorinated Pesticide/PCB Data from SDG L5997. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Calibrations

The aroclor calibration summary pages for AR1260 were not present in the data package. The appropriate calibration was found in SDG L5959. No qualifications were required. However, a complete data package is required for each SDG.

Continuing Calibrations

One (1) sample required qualifications due to a non-compliant %D in the associated CCV.

**DATA ASSESSMENT NARRATIVE
CHLORINATED PESTICIDES/PCBs**

PAGE - 2

Continuing Calibrations, continued

Specific Finding

The following compound in the noted sample is qualified as estimated, J, due to a non-compliant %D in the CCV3A, 12/15/95, 1504 on the RTX1701 column on the 12/10/95 sequence.

038GW00101 4,4'-DDT

Surrogate Recoveries

One (1) sample required qualification because of surrogate recoveries below the QC limit.

Specific Finding

The following sample exhibited a DCB recovery below the QC limits. All positive and non-detect results in the sample are qualified as estimated, J/UJ.

GDAGW01D01

Compound Quantitation

Specific Finding

For the following sample, the E flagged results are rejected in favor of the D flagged results from the dilution analysis. All other compounds in the dilution analysis are rejected, UR, in favor of the undiluted results.

038GW00101

System Performance and Overall Assessment

Overall performance as acceptable. The data reviewer estimates that 5 % of data required qualifications/rejections.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

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UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
038GW00101	4,4'-DDT	+	J
GDAGW01D01	All Compounds	+/-	J/UJ
038GW00101	All E flagged	+	R
038GW00101DL	All except corresponding D flagged results	+/-	UR

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

FUELS - GRO/DRO

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, calibration results, matrix spike recoveries and GC performance. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. SW-846 Method 8015; the National Functional Guidelines for Organic Data Review, where applicable; and EPA DQO Level III requirements. Please refer the specific findings found in each category to the Summary of Data Qualifications table.

SDG# L5997

A validation was performed on the GRO/DRO from SDGs L5997. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • Column Performance
- * • Calibrations
- * • Blanks
- * • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- * • Identification/Quantitation

* - All criteria were met for this parameter.

Overall Performance

Overall performance was acceptable. The data did not require qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

- U = Not detected
- J = Estimated value
- UJ = Reported Quantitation limit is qualified as estimated
- R = Result is rejected and unusable
- D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

- CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.
- U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.
- No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>COMPOUND ID</u>	<u>DL</u>	<u>QL</u>
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NO QUALIFICATIONS WERE REQUIRED

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE METALS AND CYANIDE

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the CLP ILM03.0 Method; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L5997

A validation was performed on the Metals Data from SDG L5997. The data was evaluated based on the following parameters.

- * ● Data Completeness
- * ● Holding Times
- * ● Calibrations
- Blanks
- * ● Interferences
- Matrix Spike Recovery
- * ● Matrix Duplicates
- * ● Field Duplicates
- * ● Laboratory Control Samples
- Serial Dilutions
- MSAs

* - All criteria were met for this parameter.

Preparation and Field Blanks

Specific Finding

The preparation blank exhibited contamination for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Iron	21.9 ug/l	no impact
Sodium	133. ug/l	no impact
Zinc	6.33 ug/l	038G-W01D01

The USEPA requires that all sample values below five times the preparation, field, DI or calibration blank contamination be qualified as non-detect, "U". The field or DI water blanks exhibited contamination but had no impact on the data.

Matrix Spike Recovery

Specific Finding

The Matrix Spike recovery for waters for Iron was below the lower control limits. All positive and non-detect results are qualified as estimated, "J" or "UJ".

Serial Dilution

Specific Finding

The Serial Dilution for water for Iron and Sodium were outside the control limits. All positive results are qualified as estimated, "J".

MSAs

Specific Finding

The post digestion spike recovery for GFAA was below the lower control limits. All positive and non-detect results for the listed samples below are qualified as estimated, "J" or "UJ".

<u>Element</u>	<u>Sample IDs</u>	<u>% recoveries</u>
Selenium	GDAGW01D01	79
Thallium	GDAGW01D01	51
Thallium	038GW00101	68
Thallium	038GW01D01	63
Thallium	038GW00201	68
Thallium	506GW00101	76
Thallium	GDAGW00101	76

Specific Finding

All sample results left with a "B" qualifier after all other qualifications, will be qualified with a "J" qualifier in place of the "B" per Ensafé's request.

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
038GW01D01	Zn.	+	U
all water samples	Fe.	+ / U	J / UJ
all water samples	Fe and Na.	+	J
GDAGW01D01.	Se.	+ / U	J / UJ
038GW00101, 01D01, 0201,	Tl.		
506GW00101, GDAGW00101 and			
01D01.			
All "B" results	all analytes	B	J



HEARTLAND

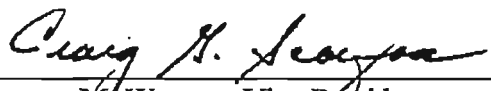
ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: L6007
Date: February 15, 1996
Client Name: Ensafe/Allen & Hoshall
Project/Site Name: Charleston; Zone A
Date Sampled: December 8, 1995
Number of Samples: 1 Aqueous Sample(s) with 1 MS/MSD(s)
Laboratory: Lockheed Analytical Services
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, June 1991 and February, 1994, respectively
QA/QC Level: EPA DQO Level IV
Method(s) Utilized: SW846 Third Edition
Analytical Fractions: Volatiles, Semivolatiles, Pesticides w/PCB's, Herbicides, Organophosphorus Pesticides, Petroleum Hydrocarbons, Dissolved Solids, Chlorides, Sulfates, Hexavalent Chromium. Metals, Cyanide

Analytical data in this report were screened to determine usability of results and also to determine contractual compliance relative to these requirements and deliverables. This screening assumes analytical results are correct as reported and merely provides an interpretation of the reported quality control results. A minimum of 10% of all laboratory calculations have been verified as part of this validation. All instrument output, i.e. spectra, chromatograms, etc., for each sample have been carefully reviewed. The end-user is urged to review the Specific Findings and associated Data Qualifications presented in this report. Annotated Form 1s or spreadsheets for all samples reviewed are included after the Data Assessment Narratives. Form 1s for MS/MSD samples or spreadsheets are not annotated.

The release of this Data Validation Report is authorized by the following signature:



Eugene M. Watson, Vice President

2-22-96

Date

SDG# 6007

Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

ENSAFE ID	MATRIX	VOA		SV		P/P		HERB		OPP		TPH		TDS		CHL		SUL		HCR		TAL		CN	
GDAHWO2D01	WATER	X		X		X		X		X		X		X		X		X		X		X		X	
Total Billable Samples (Water/Soil)		1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0

VOA = SW846 Volatiles

SV = SW846 Semivolatiles

P/P = SW846 Pesticide/PCB's

HERB = SW846 Herbicides

OPP = SW846 Organophosphorus Pesticides

TPH = SW846 Petroleum Hydrocarbons

TDS = SW846 Dissolved Solids

CHL = SW846 Chlorides

SUL = SW846 Sulfates

HCR = SW846 Hexavalent Chromium

TAL = SW846 Metals

CN = SW846 Cyanide

DATA ASSESSMENT NARRATIVES

DATA ASSESSMENT NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8260; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L6007

A validation was performed on the Volatile Data from SDG L6007. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibration
- Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Internal Standard Performance
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Initial Calibration

The target compound chloroprene was calibrated as a single point with the BFB tune injection. The compound was not present in the ICAL or CCAL standards.

Specific Findings

The following compound is rejected in all samples due to an invalid calibration.

All samples

Chloroprene

**DATA ASSESSMENT NARRATIVE
VOLATILE ANALYSIS**

PAGE - 2

Continuing Calibrations

The continuing calibration analyzed exhibited non-compliant %Ds and RRFs for compounds which required qualification of the data.

Specific Findings

The continuing calibration, E0814.D, contained compounds with %Ds greater than 50% but less than 90%. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J. and the non-detect results are qualified as estimated, UJ.

GDAHW02D01 chloroethane

The continuing calibration, E0814.D, contained compounds with RRFs less than 0.05 or %Ds greater than 90%. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J. and the non-detect results are rejected, R.

GDAHW02D01 acetonitrile
 1,4-dioxane

Field QC Blanks

The field QC blanks exhibited contamination. The sample required qualification.

	042EW00201	505FW00101
acetone	-----	6.2 µg/L
chloroform	4.7 µg/L	5.7 µg/L
trichloroethene	-----	2.8 µg/L
4-methyl-2-pentanone	-----	1.6 µg/L
toluene	-----	1.4 µg/L

**DATA ASSESSMENT NARRATIVE
VOLATILE ANALYSIS**

PAGE - 3

Field QC Blanks, continued

Specific Finding

	<u>Samples</u>	<u>Compound</u>	<u>Qualification</u>
042EW00201	GDAJW02D01	chloroform	U

System Performance and Overall Assessment

Overall performance was acceptable with the exception of the compound chloroprene. The data reviewer estimates less than 5% of data required qualifications/rejections.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
All samples	Chloroprene	+/-	J/R
GDAHW02D01	chloroethane	+/-	J/UJ
GDAHW02D01	acetonitrile 1,4-dioxane	+/-	J/R
GDAHW02D01	chloroform	+	U

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA 8270 Appendix IX; National Functional Guidelines for Organic Data Review, and DQO Level IV. All comments made within this report should be considered when examining the analytical results (Form I's).

SDG # L6007

A validation was performed on the Semivolatile Data from SDG L6007. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- * • Calibrations
- * • Internal Standard Performance
- * • Blanks
- * • Surrogate Recoveries
- * • Laboratory Control Sample
- * • Field Duplicates
- * • Compound Identification /Quantitation

* - All criteria were met for this parameter

Contractual Non compliance

The laboratory is not evaluating sample surrogate recoveries based on the multi-laboratory limits found in the SW846 method 8270 on page 8270-31. The laboratory evaluated the sample surrogate recoveries based on their own laboratory generated limits. Heartland ESI's data evaluation will be based on the established multi-laboratory surrogate recovery limits and the National Functional Guidelines, not the laboratory generated recovery limits.

System Performance and Overall Assessment

The overall system performance was fair. The laboratory did not encounter any large problems. The data reviewer estimates that none of this data requires qualification.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

DATA ASSESSMENT NARRATIVE

CHLORINATED PESTICIDES/PCBs

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8080; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L6007

A validation was performed on the Chlorinated Pesticide/PCB Data from SDG L6007. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

System Performance and Overall Assessment

Overall performance as acceptable. The data did not require qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
------------------	-------------------	-----------	-----------

NO QUALIFICATIONS WERE REQUIRED.

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

CHLORINATED HERBICIDES

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8150; the National Functional Guidelines for Organic Data Validation, June 1991; and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L6007

A validation was performed on the Herbicide Data from SDG L6007. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- * • Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 10% of the data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
------------------	-------------------	-----------	-----------

NO QUALIFICATIONS ARE REQUIRED.

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE

ORGANOPHOSPHORUS PESTICIDES

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8140; the National Functional Guidelines for Organic Data Validation, June 1991; and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L6007

A validation was performed on the Organophosphorus Pesticide Data from SDG L6007. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC Performance
- * • Calibration
- * • Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 10% of the data required qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
------------------	-------------------	-----------	-----------

NO QUALIFICATIONS ARE REQUIRED.

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non-detect result

DATA ASSESSMENT NARRATIVE

FUELS - GRO/DRO

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, calibration results, matrix spike recoveries and GC performance. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. SW-846 Method 8015; the National Functional Guidelines for Organic Data Review, where applicable; and EPA DQO Level III requirements. Please refer the specific findings found in each category to the Summary of Data Qualifications table.

SDG# L6007

A validation was performed on the GRO/DRO from SDGs L6007. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • Column Performance
- * • Calibrations
- * • Blanks
- * • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- * • Identification/Quantitation

* - All criteria were met for this parameter.

Overall Performance

Overall performance was acceptable. The data did not require qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

- U = Not detected
- J = Estimated value
- UJ = Reported Quantitation limit is qualified as estimated
- R = Result is rejected and unusable
- D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

- CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.
- U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.
- No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>COMPOUND ID</u>	<u>DL</u>	<u>QL</u>
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NO QUALIFICATIONS WERE REQUIRED

- * DL denotes the Form I qualifier supplied by the laboratory
- QL denotes the qualifier used by the data validation firm
- + in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE METALS, WET CHEMISTRY AND CYANIDE

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the CLP ILM03.0 Method; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level IV requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L6007

A validation was performed on the Metals Data from SDG L6007. The data was evaluated based on the following parameters.

- * ● Data Completeness
- * ● Holding Times
- * ● Calibrations
- Blanks
- * ● Interferences
- Matrix Spike Recovery
- Matrix Duplicates
- * ● Field Duplicates
- * ● Laboratory Control Samples
- Serial Dilutions
- MSAs

* - All criteria were met for this parameter.

Preparation and Field Blanks

Specific Finding

The preparation blank exhibited contamination for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Calcium	29.4 ug/l	no impact
Iron	16.1 ug/l	no impact
Sodium	162. ug/l	no impact

The USEPA requires that all sample values below five times the preparation, field, DI or calibration blank contamination be qualified as non-detect, "U". The field or DI water blanks exhibited contamination but had no impact on the data.

Matrix Spike Recovery

Specific Finding

The Matrix Spike recoveries for waters for Lead, Selenium and Thallium were below 30%. All non-detect results are rejected and all positive results are qualified as estimated, "J".

The Matrix Spike recoveries for waters for Barium, Beryllium, Chromium, Cobalt, Iron, Nickel and Hexavalent Chromium were below the lower control limits. All positive and non-detect results are qualified as estimated, "J" or "UJ".

Duplicate Analysis

Specific Finding

The duplicate analysis for Thallium was outside the control limits. All positive results are qualified as estimated, "J".

Serial Dilution

Specific Finding

The Serial Dilutions for water for Calcium, Manganese and Sodium were outside the control limits. All positive results are qualified as estimated, "J".

MSAs

Specific Finding

The post digestion spike recovery for GFAA was below the lower control limits. All positive and non-detect results for the listed samples below are qualified as estimated, "J" or "UJ".

<u>Element</u>	<u>Sample IDs</u>	<u>% recoveries</u>
Lead	GDAHW02D01	47
Selenium	GDAHW02D01	79
Thallium	GDAHW02D01	56

Specific Finding

All sample results left with a "B" qualifier after all other qualifications, will be qualified with a "J" qualifier in place of the "B" per Ensafe's request.

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
All water samples	Pb, Se and Tl.	+ U	J R
All water samples	Ba, Be, Cr, Co, Fe, Ni and Hex Cr.	+ / U	J / UJ
All water samples	Tl.	+	J
All water samples	Ca, Mn and Na.	+	J
GDAHW02D01.	Pb, Se and Tl.	+ / U	J / UJ
All "B" results	all analytes	B	J



HEARTLAND

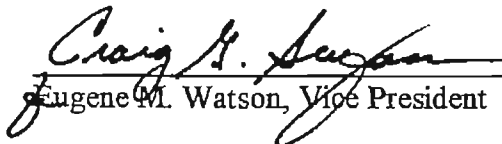
ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: L6008
Date: February 15, 1996
Client Name: Ensafe/Allen & Hoshall
Project/Site Name: Charleston; Zone A
Date Sampled: December 8, 1995
Number of Samples: 5 Aqueous Sample(s) with 3 MS/MSD(s)
Laboratory: Lockheed Analytical Services
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, June 1991 and February, 1994, respectively
QA/QC Level: EPA DQO Level III
Method(s) Utilized: SW846 Third Edition
Analytical Fractions: Volatiles, Semivolatiles, pesticides w/PCB's, Dissolved Solids, Chlorides, Sulfates, Metals, Cyanide

Analytical data in this report were screened to determine usability of results and also to determine contractual compliance relative to these requirements and deliverables. This screening assumes analytical results are correct as reported and merely provides an interpretation of the reported quality control results. A minimum of 10% of all laboratory calculations have been verified as part of this validation. All instrument output, i.e. spectra, chromatograms, etc., for each sample have been carefully reviewed. The end-user is urged to review the Specific Findings and associated Data Qualifications presented in this report. Annotated Form 1s or spreadsheets for all samples reviewed are included after the Data Assessment Narratives. Form 1s for MS/MSD samples or spreadsheets are not annotated.

The release of this Data Validation Report is authorized by the following signature:


Eugene M. Watson, Vice President

2-21-96
Date

SDG# L6008

Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

ENSAFE ID	MATRIX	VOA		SV		P/P		TDS		CHL		SUL		TAL		CN	
GDAGW00201	WATER	X		X		X								X		X	
GDAGW00301	WATER	X		X		X								X		X	
GDATW00301	WATER	X															
GDAGW02D01	WATER	X		X		X		X		X		X		X		X	
GDAGW03D01	WATER	X		X		X		X		X		X		X		X	
Total Billable Samples (Water/Soil)		5	0	4	0	4	0	2	0	2	0	2	0	4	0	4	0

VOA = SW846 Volatiles

SV = SW846 Semivolatiles

P/P = SW846 Pesticide/PCB's

TDS = SW846 Petroleum hydrocarbons

CHL = SW846 Chlorides

SUL = SW846 Sulfates

TAL = SW846 Metals

CN = SW846 Cyanide

DATA ASSESSMENT NARRATIVES

DATA ASSESSMENT NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8260; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L6008

A validation was performed on the Volatile Data from SDG L6008. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibration
- Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Internal Standard Performance
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Continuing Calibrations

The continuing calibration analyzed exhibited non-compliant %Ds for compounds which required qualification of the data.

**DATA ASSESSMENT NARRATIVE
VOLATILE ANALYSIS**

PAGE - 2

Continuing Calibrations, continued

Specific Findings

The continuing calibration, I1258.D, contained compounds with %Ds greater than 50% but less than 90%. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J, and the non-detect results are qualified as estimated, UJ.

GDATW00301

bromomethane

Method Blanks

One (1) of the method blanks exhibited contamination. The samples required qualification.

	31572MB
acetone	6.6 µg/L

Specific Finding

<u>Samples</u>	<u>Compound</u>	<u>Qualification</u>
GDAGW00201	acetone	CRQL
GDAGW00301	acetone	U
GDAGW02D01		
GDAGW03D01		

**DATA ASSESSMENT NARRATIVE
VOLATILE ANALYSIS**

PAGE - 3

Field QC Blanks

The field QC blanks exhibited contamination. The samples required qualification.

	042EW00201	GDA TW00301	505FW00101
acetone	-----	-----	6.2 µg/L
chloroform	4.7 µg/L	-----	5.7 µg/L
trichloroethene	-----	-----	2.8 µg/L *
4-methyl-2-pentanone	-----	-----	1.6 µg/L
toluene	-----	-----	1.4 µg/L

Specific Finding

	<u>Samples</u>	<u>Compound</u>	<u>Qualification</u>
505FW00101	GDAGW02D01	chloroform	CRQL

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 5% of data required qualifications/rejections.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
GDATW00301	bromomethane	+/-	J/UJ
GDAGW00201	acetone	+B	CRQL
GDAGW00301	acetone	+B	U
GDAGW02D01			
GDAGW03D01			
GDAGW02D01	chloroform	+	CRQL

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA 8270; National Functional Guidelines for Organic Data Review, and DQO Level III. All comments made within this report should be considered when examining the analytical results (Form I's).

SDG # L6008

A validation was performed on the Semivolatile Data from SDG L6008. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibrations
- * • Internal Standard Performance
- Blanks
- * • Surrogate Recoveries
- * • Laboratory Control Sample
- * • Field Duplicates
- Compound Identification /Quantitation

* - All criteria were met for this parameter

Contractual Non compliance

The laboratory is not evaluating sample surrogate recoveries based on the multi-laboratory limits found in the SW846 method 8270 on page 8270-31. The laboratory evaluated the sample surrogate recoveries based on their own laboratory generated limits. Heartland ESI's data evaluation will be based on the established multi-laboratory surrogate recovery limits and the National Functional Guidelines, not the laboratory generated recovery limits.

Continuing calibrations

The continuing calibrations that were analyzed with this data package exhibited %Ds that were not within %D continuing calibration criteria. All RRFs were within calibration criteria.

DATA ASSESSMENT AND NARRATIVE

SEMIVOLATILE ANALYSIS

PAGE - 2

Continuing calibrations (continued)

Specific Finding:

The continuing calibration, S0501005, contained compounds with %Ds greater than 50%, but less than 90%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J) and all non detects as estimated (UJ).

31457MB	4-nitroaniline
GDAGW00201	benzoic acid
GDAGW00301	
GDAGW03D01	
GDAGW03D01MS	
GDAGW03D01MSD	
GDAGW02D01	

Method Blank

<u>Associated blank</u>	<u>Compound</u>	<u>Concentration</u>
31457MB	bis(2ethylhexyl)phthalate	4.6J
<u>Samples</u>	<u>Compound</u>	<u>Qualification</u>
GDAGW00301	bis(2ethylhexyl)phthalate	CRQL

Compound Identification/Quantitation

Reject sample GDAGW02D01RE, due to unnecessary analysis due to surrogate recovery evaluation mentioned previously under Contractual Non compliance. Qualify all results as rejected (R).

System Performance and Overall Assessment

The overall system performance was fair. The data reviewer estimates that less than 5% of the data is qualified.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
31457MB	4-nitroaniline	+/-	J/UJ
GDAGW00201	benzoic acid		
GDAGW00301			
GDAGW03D01			
GDAGW03D01MS			
GDAGW03D01MSD			
GDAGW02D01			
GDAGW00301	bis(2ethylhexyl)phthalate	+	CRQL
GDAGW02D01RE	All analytes	+/-	R

- * DL denotes the Form I qualifier supplied by the laboratory
 QL denotes the qualifier used by the data validation firm
 + in the DL column denotes a positive result
 - in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE

CHLORINATED PESTICIDES/PCBs

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8080; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L6008

A validation was performed on the Chlorinated Pesticide/PCB Data from SDG L6008. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- Calibration
- * • Blanks
- Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Calibrations

The aroclor calibration summary pages for AR1260 and the INDB summary pages were not present in the data package. The appropriate calibration was found in SDG L5959. No qualifications were required. However, a complete data package is required for each SDG.

**DATA ASSESSMENT NARRATIVE
CHLORINATED PESTICIDES/PCBs**

PAGE - 2

Surrogate Recoveries

One (1) sample required qualification because of surrogate recoveries below the QC limit.

Specific Finding

The following sample exhibited a DCB recovery below the QC limits. All positive and non-detect results in the sample are qualified as estimated, J/UJ.

GDAGW00301

System Performance and Overall Assessment

Overall performance as acceptable. The data reviewer estimates that 5% of data required qualifications/rejections.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
GDAGW00301	All Compounds	+/-	J/UJ

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

DATA ASSESSMENT NARRATIVE METALS, WET CHEMISTRY AND CYANIDE

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the CLP ILM03.0 Method; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # L6008

A validation was performed on the Metals Data from SDG L6008. The data was evaluated based on the following parameters.

- * ● Data Completeness
- * ● Holding Times
- * ● Calibrations
- Blanks
- * ● Interferences
- Matrix Spike Recovery
- Matrix Duplicates
- * ● Field Duplicates
- * ● Laboratory Control Samples
- Serial Dilutions
- MSAs

* - All criteria were met for this parameter.

Preparation and Field Blanks

Specific Finding

The preparation blank exhibited contamination for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Calcium	29.4 ug/l	no impact
Iron	16.1 ug/l	no impact
Sodium	162. ug/l	no impact

The USEPA requires that all sample values below five times the preparation, field, DI or calibration blank contamination be qualified as non-detect, "U". The field or DI water blanks exhibited contamination but had no impact on the data.

Matrix Spike Recovery

Specific Finding

The Matrix Spike recoveries for waters for Lead, Selenium and Thallium were below 30%. All non-detect results are rejected and all positive results are qualified as estimated, "J".

The Matrix Spike recoveries for waters for Barium, Beryllium, Chromium, Cobalt, Iron and Nickel were below the lower control limits. All positive and non-detect results are qualified as estimated, "J" or "UJ".

Duplicate Analysis

Specific Finding

The duplicate analysis for Thallium was outside the control limits. All positive results are qualified as estimated, "J".

Serial Dilution

Specific Finding

The Serial Dilutions for water for Calcium, Manganese and Sodium were outside the control limits. All positive results are qualified as estimated, "J".

MSAs

Specific Finding

The post digestion spike recovery for GFAA was below the lower control limits. All positive and non-detect results for the listed samples below are qualified as estimated, "J" or "UJ".

<u>Element</u>	<u>Sample IDs</u>	<u>% recoveries</u>
Selenium	GDAGW03D01	75
Thallium	GDAGW00201	70
Thallium	GDAGW00301	51
Thallium	GDAGW02D01	70

Thallium GDAGW03D01 39

The post digestion spike recovery for GFAA was above the upper control limits. All positive results for the listed samples below are qualified as estimated, "J".

<u>Element</u>	<u>Sample IDs</u>	<u>% recoveries</u>
Arsenic	GDAGW00201	116
Lead	GDAGW00301	116

Specific Finding

All sample results left with a "B" qualifier after all other qualifications, will be qualified with a "J" qualifier in place of the "B" per Ensafe's request.

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
All water samples	Pb, Se and Tl.	+	J
All water samples	Ba, Be, Cr, Co, Fe and Ni.	+ / U	J / UJ
All water samples	Tl.	+	J
All water samples	Ca, Mn and Na.	+	J
GDAGW03D01.	Se.	+ / U	J / UJ
GDAGW00201, 301, 2D01 and 3D01.	Tl.		
GDAGW00201.	As.	+	J
GDAGW00301.	Pb.		
All "B" results	all analytes	B	J

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
PROJECT NUMBER: 8500.14
CONTRACTED LAB: Lockheed Analytical Services
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3/90
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994
SAMPLE MATRICES: Water and Soil
TYPES OF ANALYSES: Volatile Organics, Pesticides/PCB's
SDG NUMBER: L7263 (Level III)

SAMPLES:

Client <u>Sample #</u>	Lab <u>Sample #</u>	<u>Matrix</u>	<u>Volatile Organics</u>	<u>Pesticides/ PCB's</u>
039GP007LH	L7263-1	Water	X	
039GP009LH	L7263-4	Water	X	
039GP009LHDL	L7263-4DL	Water	+	
039SP009LH	L7263-11	Soil	X	
039SP009LHDL	L7263-11DL	Soil	+	
039SP011LH	L7263-9	Soil	X	
039SP011LHDL	L7263-9DL	Soil	+	
038SB01101	L7263-13	Soil		X
038SB01101DL	L7263-13DL	Soil		+
038SB01201	L7263-14	Soil		X
038SB01201DL	L7263-14DL	Soil		+
038SB01301	L7263-15	Soil		X
038SB01401	L7263-16	Soil		X
038SB01401DL	L7263-16DL	Soil		+
039TB01401	L7264-7	Water	X	
039TB01401RE	L7264-7RE	Water	+	
039GP007LHMS	38313MS	Water	+	
039GP007LHMSD	38313MSD	Water	+	
039SP011LHMS	38481MS	Soil	+	
039SP011LHMSD	38481MSD	Soil	+	

Client	Lab		Volatile	Pesticides/
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Organics</u>	<u>PCB's</u>
038SB01401MS	38398MS	Soil		+
038SB01401MSD	38398MSD	Soil		+

+ = Non-billable DL, RE or QC Sample

D = DILUTION, MS = MATRIX SPIKE, MSD = MATRIX SPIKE DUPLICATE, RE = REANALYSIS,
TB = TRIP BLANK

DATA REVIEWER(S): Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions

- J - The association numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Lockheed Analytical Services - L7263 Level III, CLP Organics

SAMPLES: 039GP007LH, 039GP009LH, 039GP009LHDL, 039SP009LH, 039SP009LHDL, 039SP011LH, 039SP011LHDL, 038SB01101, 038SB01101DL, 038SB01201, 038SB01201DL, 038SB01301, 038SB01401, 038SB01401DL, 038TB01401, 038TB01401RE, 039GP007LHMS, 039GP007LHMSD, 039SP011LHMS, 039SP011LHMSD, 038SB01401MS, 038SB01401MSD

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC/MS Tuning:

All GC/MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met. No action was necessary.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 6/20/96 at 17:00 on instrument E for the following compounds:

chloromethane	25.7%
bromomethane	29.7%
chloroethane	53.8%
trichlorofluoromethane	76.8%
4-methyl-2-pentanone	34.8%
1,1,2,2-tetrachloroethane	35.9%

The results for these compounds in associated samples 039GP007LH and 039GP009LH, which consisted entirely of non-detects, were flagged as estimated (UJ).

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 6/24/96 at 09:06 on instrument J for the following compounds:

bromomethane	35.0%
trichlorofluoromethane	83.9%
4-methyl-2-pentanone	26.5%

The results for these compounds in associated samples 039SP009LH and 039SP011LH, which consisted entirely of non-detects, were flagged as estimated (UJ).

IV.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was necessary.

Trip Blank:

There were no positive detections in the trip blank. No action was taken.

V.) Surrogate Recoveries:

The Surrogate Percent Recovery (%R) of bromofluorobenzene was 119% in trip blank 038TB01401, which exceeded the 83-118% QC limits. Since this sample was a trip blank, no action was taken.

VI.) Laboratory Control Samples (LCS):

Five LCS's were analyzed with this SDG. All criteria were met. No action was necessary.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

The Relative Percent Differences (RPD's) for spiked samples 039GP007LHMS and 039GP007LHMSD exceeded their respective QC limits for the following compounds:

<u>Compound</u>	<u>RPD</u>	<u>QC Limit</u>
1,1-dichloroethene	17	14
benzene	17	11
trichloroethene	19	14
toluene	20	13
chlorobenzene	18	13

All positive and non-detect results for these compounds in unspiked sample 039GP007LH were flagged as estimated (J) and (UJ).

VIII.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was necessary.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met. No action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

Positive results for dilution analyses were not flagged (D) by the laboratory. These flags were inserted by the validator. Concentrations of acetone in samples 039SP009LH and 039SP011LH and cis-1,2-dichloroethene and benzene in sample 039GP009LH were greater than the instrument's linear calibration range. These results were replaced with the dilution analyses results with appropriate flags.

The original analysis of sample 039TB01401 was considered by the validator to be of preferable data quality to the reanalysis because of its better holding time. The original analysis was selected for validation. All laboratory data were acceptable with qualifications.

PESTICIDES/PCB's

I.) Holding Times:

All Holding Time criteria were met, so no action was required.

II.) Instrument Performance:

All Instrument Performance criteria were met. No action was taken.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met. No action was necessary.

Continuing Calibration:

All Continuing Calibration criteria were met. No action was required.

IV.) Blanks:

Method Blank:

There were no positive detections in the method blank. No action was taken.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was taken.

VI.) Laboratory Control Samples (LCS):

One LCS was analyzed in this SDG. All Percent Recovery criteria were met. No action was taken.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

The Percent Recoveries (%R's) of 4,4'-DDT in spiked samples 038SB01401MS (-360%) and 038SB01401 (-190%) were below the 57-127% QC limits. Since the sample concentration exceeded the concentration of the spike added by 16X, the results were considered by the validator to be unusable. No action was taken.

VIII.) TCL Compound Identification:

Pesticide/PCB Identification Summary (PIS):

All PIS criteria were met. No action was required.

IX.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was necessary.

X.) Pesticide Cleanup Check:

Florisil Cartridge Check:

All criteria were met, so no action was taken.

Gel Permeation Chromatography (GPC):

All GPC criteria were met. No action was necessary.

XL.) Overall Assessment of Data/General:

Positive results for the dilution analyses were not flagged (D) by the laboratory. These flags were inserted by the validator. Concentrations of 4,4'-DDE, 4,4'-DDT and 4,4'-DDD were greater than the instrument's linear calibration range in samples 038SB01101, 038SB01201 and 038SB01401. These results were replaced with the dilution analyses results with appropriate flagging. All other laboratory data were acceptable without qualification.

VALIDATA

Chemical Services, Inc.

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DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
PROJECT NUMBER: 8500.14
CONTRACTED LAB: Lockheed Analytical Services
QA/QC LEVEL: EPA Level IV
EPA METHOD: EPA SOW 3/90
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994
SAMPLE MATRIX: Soil
TYPE OF ANALYSIS: Semivolatile Organics
SDG NUMBER: L7277 (Level IV)

SAMPLES:

Client	Lab		
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Semivolatiles</u>
505CB01901	L7277-2	Soil	X
042CB02301	L7277-1	Soil	X
042CB02301MS	38399MS	Soil	+
042CB02301MSD	38399MSD	Soil	+

+ = Non-billable QC Sample

MS = MATRIX SPIKE, MSD = MATRIX SPIKE DUPLICATE

DATA REVIEWER(S): Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UI - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Lockheed Analytical Services - L7277 Level IV, CLP Organics

SAMPLES: 505CB01901, 042CB02301, 042CB02301MS, 042CB02301MSD

SEMIVOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met. No action was necessary.

II.) GC/MS Tuning:

All GC/MS Tuning criteria were met, so no action was taken.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviations (%RSD's) exceeded the 30% QC limit for the standards analyzed on 7/10/96 for the following compounds:

n-nitrosomethylethylamine	36.6%
2-methylphenol	37.7%
4-nitroquinoline-1-oxide	35.1%
famphur	32.8%

These compounds were not detected in the associated samples. No action was necessary.

Continuing Calibration:

The Percent Difference (%D) exceeded the 25% QC limit for the standard analyzed on 7/11/96 at 09:38 for the following compounds:

famphur	51.1%
n-nitrosomethylethylamine	36.7%

The non-detect results for these compounds in associated samples 505CB01901 and 042CB02301 were flagged as estimated (UJ).

IV.) Blanks:

Method Blank:

There were no positive detections in the method blank. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was taken.

VI.) Laboratory Control Samples (LCS):

One LCS was analyzed with this SDG. All Percent Recovery criteria were met. No action was taken.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

All MS / MSD criteria were met. No action was necessary.

VIII.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was taken.

IX.) Internal Standards Performance (ISTD's):

All Internal Standard Performance criteria were met, so no action was taken.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was required.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was taken.

XII.) Tentatively Identified Compounds (TIC's):

All TIC criteria were met, so no action was necessary.

XIII.) System Performance:

All System Performance criteria were met, so no action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

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DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
PROJECT NUMBER: 8500.14
CONTRACTED LAB: Lockheed Analytical Services
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3/90
VALIDATION GUIDELINES: *USEPA CLP National Functional Guidelines for Organic Data Review, 1994*
SAMPLE MATRICES: Water and Soil
TYPES OF ANALYSES: Volatile Organics, Semivolatile Organics
SDG NUMBER: L7278 (Level III)

SAMPLES:

Client <u>Sample #</u>	Lab <u>Sample #</u>	<u>Matrix</u>	<u>Volatile Organics</u>	<u>Semivolatile Organics</u>
039GP015LH	L7278-7	Water	X	
039GP015LHDL	L7278-7DL	Water	+	
042GP003LH	L7278-1	Water	X	
043GP002LH	L7278-4	Water	X	
039SP015LH	L7278-16	Soil	X	
042SP003LH	L7278-12	Soil	X	
043SP002LH	L7278-14	Soil	X	
042SB02201	L7278-18	Soil		X
042SB02301	L7278-19	Soil		X
042SB02401	L7278-20	Soil		X
042SB02501	L7278-21	Soil		X
505SB01801	L7278-24	Soil		X
505SB01802	L7278-25	Soil		X
505SB01901	L7278-22	Soil		X
505SB01902	L7278-23	Soil		X
505SB02001	L7278-26	Soil		X

Client	Lab		Volatile	Semivolatile
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Organics</u>	<u>Organics</u>
505SB02101	L7278-27	Soil		X
505SB02101RE	L7278-27RE	Soil		+
039TP015LH	L7278-10	Water	X	
042SP003LHMS	38400MS	Soil	+	
042SP003LHMSD	38400MSD	Soil	+	
505SB01802MS	38401MS	Soil		+
505SB01802MSD	38401MSD	Soil		+

+ = Non-billable DL, RE or QC Sample

DL = DILUTION, MS = MATRIX SPIKE, MSD = MATRIX SPIKE DUPLICATE,
RE = REANALYSIS, T = TRIP BLANK

DATA REVIEWER(S): Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE: 

Data Qualifier Definitions

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Lockheed Analytical Services - L7278 Level III, CLP Organics

SAMPLES: 039GP015LH, 039GP015LHDL, 042GP003LH, 043GP002LH, 039SP015LH, 042SP003LH, 043SP002LH, 039TP015LH, 042SB02201, 042SB02301, 042SB02401, 042SB02501, 505SB01801, 505SB01802, 505SB01901, 505SB01902, 505SB02001, 505SB02101, 505SB02101RE, 042SP003LHMS, 042SP003LHMSD, 505SB01802MS, 505SB01802MSD

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met. No action was necessary.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 6/21/96 at 09:06 on instrument E for the following compounds:

bromomethane	35.4%
chloroethane	75.8%

The results for these compounds in all associated water samples, which consisted entirely of non-detects, were flagged as estimated (UJ).

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 6/24/96 at 16:09 on instrument J for the following compounds:

bromomethane	35.0%
trichlorofluoromethane	83.9%

The results for these compounds in associated soil samples, which consisted entirely of non-detects, were flagged as estimated (UJ).

IV.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was necessary.

Trip Blank:

Positive results were observed in trip blank 039TP015LH for the following compounds:

chloroform	100 ug/L
bromodichloromethane	29 ug/L
4-methyl-2-pentanone	4.7 ug/L
dibromochloromethane	9.6 ug/L
o-xylene	1.2 ug/L
m,p-xylene	3.6 ug/L

The positive results for o-xylene and m,p-xylene in associated sample 043GP002LH less than 5X the blank amounts were flagged as undetected (U) with the analytical results below the CRQL being replaced with the CRQL. There were no other detections of these compounds in the associated samples. No further action was necessary.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was taken.

VI.) Laboratory Control Samples (LCS):

Two LCS's were analyzed with this SDG. All Percent Recovery criteria were met. No action was necessary.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

All MS / MSD criteria were met. No action was required.

VIII.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was necessary.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met. No action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

The concentration of cis-1,2-dichloroethene in sample 039GP015LH was greater than the instrument's linear calibration range. This result was replaced with the dilution result and flagged (D). All other CRQL criteria were met, so no further action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

SEMIVOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met. No action was necessary.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was taken.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met. No action was taken.

Continuing Calibration:

All Continuing Calibration criteria were met. No action was necessary.

IV.) Blanks:

Method Blank:

There were no positive detections in the method blank. No action was required.

V.) Surrogate Recoveries:

The Surrogate Percent Recoveries (%R's) of 2,4,6-tribromophenol (155%) and terphenyl-d14 (175%) exceeded their respective 33-136% and 32-151% QC limits in sample 505SB2101. Since only one surrogate was outside the QC limits in each fraction, no action was required.

VI.) Laboratory Control Samples (LCS):

One LCS was analyzed with this SDG. All criteria were met. No action was taken.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

All MS / MSD Percent Recovery criteria were met. No action was necessary.

VIII.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was taken.

IX.) Internal Standards Performance (ISTD's):

All Internal Standard Performance criteria were met, so no action was taken.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was required.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits:

All CRQL criteria were met, so no action was taken.

XII.) Tentatively Identified Compounds (TIC's):

All TIC criteria were met, so no action was necessary.

XIII.) System Performance:

All System Performance criteria were met, so no action was taken.

XIV.) Overall Assessment of Data/General:

The original analysis of sample 505SB02101 was considered by the validator to be of preferable data quality to the reanalysis and was selected for validation because of better internal standard recoveries. All laboratory data were acceptable without qualification.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

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DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
SERVICE ORDER NUMBER: 0104
CONTRACTED LAB: Lockheed Analytical Services
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3-90, SW-846
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994
SAMPLE MATRIX: Soil
TYPES OF ANALYSES: Ammonia, Cation Exchange Capacity (CEC), Chlorides, Nitrate, Nitrite, pH, Phosphorus, Sulfur, Total Organic Carbon (TOC)
SDG NUMBERS: L7441 (Level III)

SAMPLES:

Client	Lab						
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Ammonia</u>	<u>CEC</u>	<u>Chlorides</u>	<u>Nitrate</u>	<u>Nitrite</u>
039SW00909	L7441-1	Soil	X	X	X	X	X
039SW00909MS	39043MS	Soil	+		+	+	+
039SW00909MSD	39043MSD	Soil	+		+	+	+

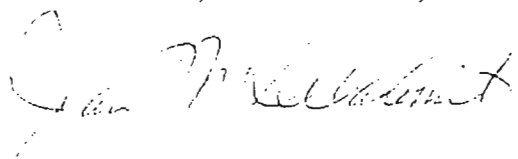
Client	Lab					
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>pH</u>	<u>Phosphorus</u>	<u>Sulfur</u>	<u>TOC</u>
039SW00909	L7441-1	Soil	X	X	X	X
039SW00909MS	39043MS	Soil		+	+	+
039SW00909MSD	39043MSD	Soil		+	+	+

+ = Non-billable Quality Control Sample

MS = MATRIX SPIKE, MSD = MATRIX SPIKE DUPLICATE

DATA REVIEWER(S): Linda H. Liu, Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions

- J - The association numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Lockheed Analytical Services - L7441, CLP Inorganics

SAMPLES: 039SW00909, 039SW00909MS, 039SW00909MSD

AMMONIA

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

Method Blank:

Ammonia was not detected in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

All MS / MSD criteria were met. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

CATION EXCHANGE CAPACITY (CEC)

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blanks:

CEC were detected at 0.348 ueq/g and 11.5 ueq/g, respectively, in method blanks BLK0744107 and BLK0744108. Since the CEC result in associated sample 039SW08D48 was greater than 5X the blank amounts, no action was taken.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

There were no MS / MSD samples in this fraction of the SDG. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

CHLORIDES

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

Method Blank:

Chloride was not detected in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

All MS / MSD criteria were met. No action was necessary.

VII.) Field Duplicates:

There was no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

NITRATE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

Method Blank:

Nitrate was not detected in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

All MS / MSD criteria were met. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

NITRITE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

Method Blank:

Nitrite was not detected in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

All MS / MSD criteria were met. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

pH

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

IV.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

V.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VI.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

PHOSPHORUS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

Method Blank:

There was no positive detection of phosphorus in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

All MS / MSD criteria were met. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

SULFUR

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

Method Blank:

Sulfur was detected at 6.4 mg/kg in the method blank. Since the sulfur result in associated sample 039SW00909 was greater than 5X the blank amount, no action was taken.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

No Duplicate Sample Analysis was performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

All MS / MSD criteria were met. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

TOTAL ORGANIC CARBON (TOC)

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

Method Blank:

There was no positive detection of TOC in the method blank, no action was taken.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

All MS / MSD criteria were met. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
SERVICE ORDER NUMBER: 0105
CONTRACTED LAB: Lockheed Analytical Services
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3-90, SW-846
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994
SAMPLE MATRIX: Soil
TYPES OF ANALYSES: Ammonia, Cation Exchange Capacity (CEC), Chlorides, Nitrate, Nitrite, pH, Phosphorus, Sulfur, Total Organic Carbon (TOC)
SDG NUMBERS: L7442 (Level III)

SAMPLES:

Client	Lab						
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Ammonia</u>	<u>CEC</u>	<u>Chloride</u>	<u>Nitrate</u>	<u>Nitrite</u>
039SW00812	L7442-1	Soil	X	X	X	X	X
039SW01208	L7442-2	Soil	X	X	X	X	X
039SW01208MS	38998MS	Soil			+	+	+
039SW01208MSD	38998MSD	Soil			+	+	+

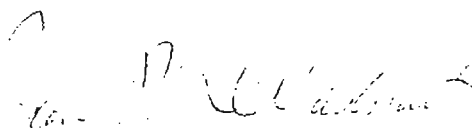
Client	Lab					
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>pH</u>	<u>Phosphorus</u>	<u>Sulfur</u>	<u>TOC</u>
039SW00812	L7442-1	Soil	X	X	X	X
039SW01208	L7442-2	Soil	X	X	X	X

+ = Non-billable Quality Control Sample

MS = MATRIX SPIKE, MSD = MATRIX SPIKE DUPLICATE

DATA REVIEWER(S): Linda H. Liu, Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Lockheed Analytical Services - L7442, CLP Inorganics

SAMPLES: 039SW00812, 039SW01208, 039SW01208MS, 039SW01208MSD

AMMONIA

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

Method Blank:

Ammonia was not detected in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

There were no MS / MSD samples in this fraction of the SDG. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

CATION EXCHANGE CAPACITY (CEC)

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blanks:

CEC was detected at 0.348 ueq/g and 11.5 ueq/g, respectively, in method blanks BLK0744207 and BLK0744208. Since the CEC result in associated sample 039SW00812 was greater than 5X the blank amounts, no action was taken. The result in associated sample 039SW01208, which was less than 5X the higher blank amount was flagged as undetected (U).

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

There were no MS / MSD samples in this fraction of the SDG. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with one qualification.

CHLORIDE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

Method Blank:

Chloride was not detected in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

All MS / MSD criteria were met. No action was necessary.

VII.) Field Duplicates:

There was no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

NITRATES

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

Method Blank:

Nitrates were not detected in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

All MS / MSD criteria were met. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

NITRITE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

Nitrite was not detected in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

All MS / MSD criteria were met. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

pH

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

IV.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

V.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VI.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

PHOSPHORUS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

Phosphorus was not detected in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

There were no MS / MSD samples in this fraction of the SDG. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

SULFUR

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

Sulfur was detected at 6.4 mg/kg in the method blank. Since the sulfur result in the associated sample 039SW00812 was greater than 5X the blank amount, no action was taken. The result in associated sample 039SW01208, which was less than 5X the blank amount, was flagged as undetected (U).

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

There were no MS / MSD samples in this fraction of the SDG. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with one qualification.

TOTAL ORGANIC CARBON (TOC)

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blanks:

There was no positive detection of TOC in the method blanks, no action was taken.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

There were no MS / MSD samples in this fraction of the SDG. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

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DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
SERVICE ORDER NUMBER: 0102
CONTRACTED LAB: Lockheed Analytical Services
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3-90, SW-846
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994; USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994

SAMPLE MATRIX: Water and Soil
TYPES OF ANALYSES: Volatile Organics, Ammonia, Cation Exchange Capacity (CEC), Chlorides, Nitrate, Nitrite, pH, Phosphorus, Sulfur, Total Organic Carbon (TOC)

SDG NUMBERS: L7450 (Level III)

SAMPLES:

Client	Lab						
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Volatiles</u>	<u>Ammonia</u>	<u>CEC</u>	<u>Chlorides</u>	<u>Nitrate</u>
0393W08D48	L7450-3	Water	X				
039SW08D48	L7450-2	Soil		X	X	X	X
039TW08D48	L7450-8	Water	X				
039EW08D48	L7450-5	Water	X				
039EW08D48MS	39445MS	Water	+				
039EW08D48MSD	39445MSD	Water	+				

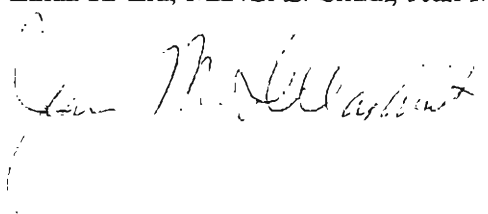
Client	Lab						
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Nitrite</u>	<u>pH</u>	<u>Phosphorus</u>	<u>Sulfur</u>	<u>TOC</u>
039SW08D48	L7450-2	Soil	X	X	X	X	X

+ = Non-billable Quality Control Sample

EW = EQUIPMENT RINSATE BLANK, MS = MATRIX SPIKE, MSD = MATRIX SPIKE
DUPLICATE, TW = TRIP BLANK

DATA REVIEWER(S): Linda H. Liu, Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:

A handwritten signature in dark ink, appearing to read "Jean M. Delashmit", written over a faint horizontal line.

Data Qualifier Definitions

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UU - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Lockheed Analytical Services - L7450, CLP Organics, CLP Inorganics

SAMPLES: 0393W08D48, 039SW08D48, 039EW08D48, 039TW08D48, 039EW08D48MS,
039EW08D48MSD

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC / MS Tuning:

All GC/MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviation (%RSD) of chloroethane was 39.2%, which exceeded the 30% QC limit for the standards analyzed on 7/26/96 on instrument GC/MS-E. This compound was not detected in the associated sample. No action was taken.

Continuing Calibration:

The Percent Difference (%D) of chloroethane was 47.0% which exceeded the 25% QC limit for the standard analyzed on 7/29/96 at 15:47 on instrument GC/MS-E. The non-detect result for this compound in associated sample 0393W08D48 was flagged as estimated (UJ).

IV.) Blanks:

Method Blank:

Acetone (11 ug/L), 2-butanone (2.3 ug/L) and 2-hexanone (2.2 ug/L) were detected in method blank BLK0745002. Since 2-hexanone was not detected in associated sample 0393W08D48, no action was required. Detections of acetone and 2-butanone in associated sample 0393W08D48 less than 10X the blank amounts were flagged as undetected (U) with the quantitation limit being raised to the level of contamination in the sample.

Equipment Rinsate Blank:

Acetone (8.7 ug/L), chloroform (31 ug/L), bromodichloromethane (7.7 ug/L) and dibromochloromethane (1.5 ug/L) were detected in the equipment rinsate blank. Acetone was flagged using the method blank. Since chloroform, bromodichloromethane and dibromochloromethane were not detected in the associated sample, no further action was taken.

Trip Blank:

Methylene chloride (1.3 ug/L) and acetone (7.7 ug/L) were detected in trip blank 039TW08D48. Acetone was flagged using the method blank. Since methylene chloride was not detected in the associated sample, no further action was taken.

TIC's:

All TIC criteria were met. No action was necessary.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was required.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

All MS / MSD criteria were met, no action was taken.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was required.

VIII.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was required.

IX.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

X.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XI.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

WET CHEMISTRY ANALYSES

AMMONIA

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

Method Blank:

Ammonia was not detected in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

There were no MS / MSD samples in this fraction of the SDG. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

CATION EXCHANGE CAPACITY (CEC)

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blanks:

CEC was detected at 0.348 ueq/g and 11.5 ueq/g, respectively, in the method blanks BLK0745007 and BLK0745008. The result in associated sample 039SW08D48, which was less than 5X the higher blank amount, was flagged as undetected (U).

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

There were no MS / MSD samples in this fraction of the SDG. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualification.

CHLORIDES

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

Method Blank:

Chlorides were not detected in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

There were no MS / MSD samples in this fraction of the SDG. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

NITRATES

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

Method Blank:

Nitrates were not detected in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

There were no MS / MSD samples in this fraction of the SDG. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

NITRITE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

Method Blank:

Nitrite was not detected in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

There were no MS / MSD samples in this fraction of the SDG. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

pH

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

IV.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

V.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VI.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

PHOSPHORUS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

Method Blank:

Phosphorus was not detected in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

There were no MS / MSD samples in this fraction of the SDG. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

SULFUR

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

Method Blank:

Sulfur was detected at 6.4 mg/kg in the method blank. Since the sulfur result in associated sample 039SW08D48 was greater than 5X the blank amount, no action was taken.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

There were no MS / MSD samples in this fraction of the SDG. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

TOTAL ORGANIC CARBON (TOC)

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

Method Blank:

TOC was not detected in the method blank, so no action was taken.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

There were no MS / MSD samples in this fraction of the SDG. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
SERVICE ORDER NUMBER: 0103
CONTRACTED LAB: Lockheed Analytical Services
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3-90, SW-846
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994
SAMPLE MATRIX: Soil
TYPES OF ANALYSES: Ammonia, Cation Exchange Capacity (CEC), Chloride, Nitrate, Nitrite, pH, Phosphorus, Sulfur, Total Organic Carbon (TOC)
SDG NUMBER: L7460 (Level III)

SAMPLES:

Client	Lab						
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Ammonia</u>	<u>CEC</u>	<u>Chloride</u>	<u>Nitrate</u>	<u>Nitrite</u>
039SW12D30	L74605	Soil	X	X	X	X	X
039SW12D30MS	39253MS	Soil	+		+	+	+
039SW12D30MSD	39253MSD	Soil	+		+	+	+

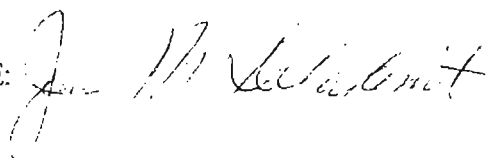
Client	Lab					
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>pH</u>	<u>Phosphorus</u>	<u>Sulfur</u>	<u>TOC</u>
039SW12D30	L74605	Soil	X	X	X	X
039SW12D30MS	39253MS	Soil		+		
039SW12D30MSD	39253MSD	Soil		+		

+ = Non-billable Quality Control Sample

MS / MSD = MATRIX SPIKE/MATRIX SPIKE DUPLICATE

DATA REVIEWER(S): Linda H. Liu, Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions

- J - The association numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Lockheed Analytical Services - L7460, CLP Inorganics

SAMPLES: 039SW12D30, 039SW12D30MS, 039SW12D30MSD

AMMONIA

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

Ammonia was not detected in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

All MS / MSD criteria were met. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

CATION EXCHANGE CAPACITY (CEC)

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blanks:

CEC were detected at 0.348 ueq/g and 11.5 ueq/g, respectively, in method blanks BLK076001 and BLK076002. Since the CEC amount found in associated sample 039SW12D30 was greater than 5X the blank amounts, no action was taken.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

There were no MS / MSD samples in this fraction of the SDG. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

CHLORIDE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

Chloride was not detected in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

All MS / MSD criteria were met. No action was necessary.

VII.) Field Duplicates:

There was no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

NITRATE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

Nitrate was not detected in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

All MS / MSD criteria were met. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

NITRITE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

Nitrite was not detected in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

All MS / MSD criteria were met. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

pH

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

IV.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

V.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VI.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

PHOSPHORUS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

Phosphorus was not detected in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

All MS / MSD criteria were met. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

SULFUR

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

Sulfur was detected at 6.4 mg/kg in the method blank. Since the sulfur result in associated sample 039SW12D30 was greater than 5X of the blank amount, no action was taken.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

All MS / MSD criteria were met. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

TOTAL ORGANIC CARBON

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

There was no positive detection of TOC in the method blanks, no action was taken.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this fraction of the SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

All MS / MSD criteria were met. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
SERVICE ORDER NUMBER: 0106
CONTRACTED LAB: Lockheed Analytical Services
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3-90, SW-846
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994

SAMPLE MATRIX: Soil
TYPES OF ANALYSES: Ammonia, Cation Exchange Capacity (CEC), Chlorides, Nitrate, Nitrite, pH, Phosphorus, Sulfur, Total Organic Carbon (TOC)

SDG NUMBERS: L7469 (Level III)

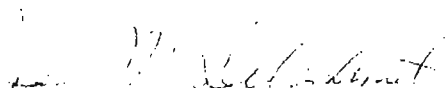
SAMPLES:

Client	Lab						
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Ammonia</u>	<u>CEC</u>	<u>Chloride</u>	<u>Nitrate</u>	<u>Nitrite</u>
039SW12D46	L7469-1	Soil	X	X	X	X	X

Client	Lab					
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>pH</u>	<u>Phosphorus</u>	<u>Sulfur</u>	<u>TOC</u>
039SW12D46	L7469-1	Soil	X	X	X	X

DATA REVIEWER(S): Linda H. Liu, Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Lockheed Analytical Services - L7469, CLP Inorganics

SAMPLE: 039SW12D46

AMMONIA

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

Ammonia was not detected in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

There were no MS / MSD samples in this SDG. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

CATION EXCHANGE CAPACITY (CEC)

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blanks:

CEC was detected at 0.348 ueq/g and 11.5 ueq/g, respectively, in the method blanks BLK0746901 and BLK0746902. Since the CEC result in associated sample 039SW12D46 was greater than 5X the blank amounts, no action was taken.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

There were no MS / MSD samples in this SDG. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

CHLORIDE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

There was no positive detection of chloride in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

There were no MS / MSD samples in this SDG. No action was necessary.

VII.) Field Duplicates:

There was no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

NITRATE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

There was no positive detection of nitrate in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

There were no MS / MSD samples designated in this SDG. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

NITRITE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

There was no positive detection of nitrite in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

There were no MS / MSD samples in this SDG. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

pH

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

IV.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

V.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VI.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

PHOSPHORUS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

Phosphorus was not detected in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

There were no MS / MSD samples in this SDG. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

No spreadsheets for phosphorus were included in the data package. A copy of the Form I is included as a replacement for the mission data.

SULFUR

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blank:

Sulfur was detected at 6.4 mg/kg in the method blank. Since the sulfur result in associated sample 039SW12D46 was greater than 5X the blank amount, no action was taken.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

There were no MS / MSD samples in this SDG. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

TOTAL ORGANIC CARBON

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Calibration criteria were met, so no action was taken.

III.) Blanks:

There was no positive detection of TOC in the method blanks, no action was taken.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

There were no MS / MSD samples in this SDG. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples designated in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.



HEARTLAND

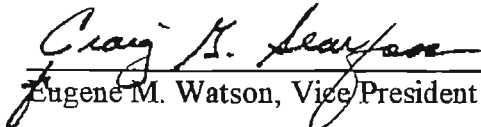
ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: 25149
Date: May 1, 1996
Client Name: Ensafe/ Allen & Hoshall
Project/Site Name: Charleston; Zone A
Date Sampled: April 3, 1996
Number of Samples: 11 Aqueous Sample(s) with 0 MS/MSD(s)
Laboratory: Southwest Laboratory of Oklahoma
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, June 1991 and February, 1994, respectively
QA/QC Level: EPA DQO Level III
Method(s) Utilized: SW846 Third Edition
Analytical Fractions: Volatiles

Analytical data in this report were screened to determine usability of results and also to determine contractual compliance relative to these requirements and deliverables. This screening assumes analytical results are correct as reported and merely provides an interpretation of the reported quality control results. A minimum of 10% of all laboratory calculations have been verified as part of this validation. All instrument output, i.e. spectra, chromatograms, etc., for each sample have been carefully reviewed. The end-user is urged to review the Specific Findings and associated Data Qualifications presented in this report. Annotated Form 1s or spreadsheets for all samples reviewed are included after the Data Assessment Narratives. Form 1s for MS/MSD samples or spreadsheets are not annotated.

The release of this Data Validation Report is authorized by the following signature:


Eugene M. Watson, Vice President

5-1-96
Date

SDG# 25149

Samples and Fractions Reviewed

Sample Identifications Analytical Fractions

ENSAFE ID	MATRIX	VOA	
039GW00102	WATER	X	
039GW00202	WATER	X	
039GW00302	WATER	X	
039GW00402	WATER	X	
039GW00502	WATER	X	
042GW00102	WATER	X	
042GW00202	WATER	X	
042GW00302	WATER	X	
505GW00102	WATER	X	
CNSGW00602	WATER	X	
CNSTW00602	WATER	X	
Total Billable Samples (Water/Soil)		11	0

VOA = SW846 Volatiles

DATA ASSESSMENT NARRATIVE

VOLATILE ORGANICS

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard areas. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8240; the National Functional Guidelines for Organic Data Validation, June 1991, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # 25149

A validation was performed on the Volatile Data from SDG 25149. The data was evaluated based on the following parameters:

- * • Data Completeness
- * • Holding Times
- * • GC/MS Tuning
- Calibration
- Blanks
- * • Surrogate Recoveries
- * • Matrix Spike/Matrix Spike Duplicates
- * • Field Duplicates
- * • Internal Standard Performance
- * • Compound Identification
- * • Compound Quantitation

* - All criteria were met for this parameter.

Continuing Calibrations

The continuing calibration analyzed exhibited non-compliant %Ds for compounds which required qualification of the data.

**DATA ASSESSMENT NARRATIVE
VOLATILE ANALYSIS**

PAGE - 2

Continuing Calibrations, continued

Specific Findings

The continuing calibration, UJ683.D, contained compounds with %Ds greater than 90%. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J. and the non-detect results are rejected, R.

039GW00102	vinyl acetate (98.2%)
039GW00202	
039GW00302	
039GW00402	
505GW00101	
042GW00102	
042GW00202	
042GW00302	
CNSGW00602	

The continuing calibration, UJ699.D, contained compounds with %Ds greater than 90%. For the samples and non-compliant compounds listed below, the positive results are qualified as estimated, J. and the non-detect results are rejected, R.

039GW00502	vinyl acetate (94.9%)
------------	-----------------------

Trip Blanks

The trip blank associated with the samples exhibited contamination. The samples required qualification.

	CNSTW00602
acetone	2 µg/L
chloroform	4 µg/L

Specific Finding

<u>Samples</u>	<u>Compound</u>	<u>Action Level</u>	<u>Qualification</u>
039GW00202 505GW00101	acetone	20 µg/L	CRQL

**DATA ASSESSMENT NARRATIVE
VOLATILE ANALYSIS**

PAGE - 3

System Performance and Overall Assessment

Overall performance was acceptable. The data reviewer estimates less than 5% of data required qualifications/rejections.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

R = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

No Action = The sample result for the blank contaminant is greater than the sample CRQL and is greater than 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>ANALYTE ID</u>	<u>DL</u>	<u>QL</u>
039GW00102	vinyl acetate	+/-	J/R
039GW00202			
039GW00302			
039GW00402			
505GW00101			
042GW00102			
042GW00202			
042GW00302			
CNSGW00602			
039GW00502	vinyl acetate	+/-	J/R
039GW00202	acetone	+	CRQL
505GW00101			

- * DL denotes the Form I qualifier supplied by the laboratory
QL denotes the qualifier used by the data validation firm
+ in the DL column denotes a positive result
- in the DL column denotes a non detect result

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
SERVICE ORDER NUMBER: 0142
CONTRACTED LAB: Southwest Laboratories of Oklahoma, Inc.
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3-90
VALIDATION GUIDELINES: *USEPA CLP National Functional Guidelines for Organic Data Review, 1994*

SAMPLE MATRIX: Water
TYPE OF ANALYSIS: Volatile Organics

SDG NUMBER: 27136 (Level III)

SAMPLES:

Client <u>Sample #</u>	Lab <u>Sample #</u>	<u>Matrix</u>	<u>Volatile Organics</u>
039GP02510	27136-07	Water	X
039GP02520	27136.08	Water	X
039GP02611	27150.09	Water	X
039GP02711	27136.06	Water	X
039GP02910	27150.10	Water	X
039GP03211	27136.05	Water	X
039G003411	27136.04	Water	X
039GP03511	27136.01	Water	X
039GP03530	27136.02	Water	X
039GP03611	27136.03	Water	X
039GP03711	27150.11	Water	X
039GP03719	27150.12	Water	X
039GW04IA1	27150.05	Water	X
039GW09DA1	27150.03	Water	X
039GW09IA1	27150.04	Water	X
039GW10DA2	27150.02	Water	X
039GW10IA2	27150.01	Water	X
039GW13DA1	27150.07	Water	X
039GW13IA1	27150.06	Water	X
039TB13DA1	27150.08	Water	X
039TP02520	27136.09	Water	X

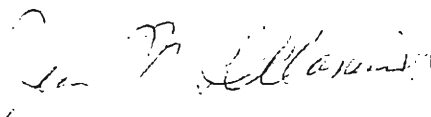
Client <u>Sample #</u>	Lab <u>Sample #</u>	<u>Matrix</u>	<u>Volatile Organics</u>
039TP03719	27150.14	Water	X
039EP03719	27136.13	Water	X
039GW10IA2MS	27150.01MS	Water	+
039GW10IA2MSD	27150.01MSD	Water	+

+ = Non-billable Quality Control sample

E = EQUIPMENT RINSATE BLANK, MS = MATRIX SPIKE, MSD = MATRIX SPIKE DUPLICATE,
T = TRIP BLANK

DATA REVIEWER(S): Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Southwest Laboratories of Oklahoma, Inc. - 27136, CLP Organics

SAMPLES: 039GP02510, 039GP02520, 039GP02611, 039GP02711, 039GP02910,
039GP03211, 039GP03411, 039GP03511, 039GP03530, 039GP03611,
039GP03711, 039GP03719, 039GW04IA1, 039GW09DA1, 039GW09IA1,
039GW10DA2, 039GW10IA2, 039GW13DA1, 039GW13DIA1, 039TB13DA1,
039TP02520, 039TP03719, 039EP03719, 039GW10IA2MS, 039GW10IA2MSD

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviations (%RSD's) exceeded the 30% QC limit for the standards analyzed on 10/1/96 on instrument R for the following compounds:

acetone	37.5%
2-chloroethyl vinyl ether	34.1%

Since these compounds were not detected in the associated samples after blank qualification, no action was necessary.

Continuing Calibration:

The Percent Difference (%D) for 2-chloroethyl vinyl ether was 36.5% for the standard analyzed on 10/1/96 at 19:13 on instrument R, which exceeded the 25% QC limit. All results for this compound in the associated samples, which consisted entirely of non-detects, were flagged as estimated (UJ). The associated samples were 039GP02510, 039GP02711, 039GP03211, 039GP03411, 039GP03511, 039GP03530 and 039GP03611.

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 10/2/96 at 15:37 on instrument R for the following compounds:

bromomethane	28.1%
chloroethane	27.1%
tetrachloroethene	57.2%
2-chloroethyl vinyl ether	44.7%

All results for bromomethane, chloroethane and 2-chloroethyl vinyl ether in the associated samples, which consisted entirely of non-detects, were flagged as estimated (UJ). All positive and non-detect results for tetrachloroethene in the associated samples were flagged as estimated (J) and (UJ). The associated samples were 039GP02611, 039GP02910, 039GP03711, 039GW09DA1, 039GW09IA1, 039GW13DA1 and 039GW13IA1.

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 10/3/96 at 09:40 on instrument R for the following compounds:

bromomethane	25.6%
chloroethane	28.9%
2-chloroethyl vinyl ether	91.8%

All results for the three compounds in the associated samples, which consisted entirely of non-detects, were flagged as estimated (UJ). The associated samples were 039GP03719, 039GW04IA1, 039GW10DA2 and 039GW10IA2.

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 10/4/96 at 10:14 on instrument R for the following compounds:

bromomethane	27.9%
2-butanone	26.4%
bromoform	29.8%
2-chloroethyl vinyl ether	68.2%

All results for the four compounds in associated sample 039GP02520, which consisted entirely of non-detects, were flagged as estimated (UJ).

IV.) Blanks:

Method Blank:

Acetone (7 ug/L) and methylene chloride (14 ug/L) were detected in method blank VBLK1. The positive detections of these two compounds in the associated samples less than 10X the blank amounts were flagged as undetected (U) with the quantitation limit being raised to the level of sample contamination. The associated samples were 039GP02510, 039GP02711, 039GP03211, 039GP03411, 039GP03511 and 039GP03611.

Acetone was detected at 8 ug/L in the method blank VBLK2. The positive detections of acetone, which were less than 10X the blank amount, were flagged as undetected (U) with the quantitation limit being raised to the level of sample contamination. The associated samples were 039GP02611, 039GP02910, 039GP03711, 039GW09DA1, 039GW09IA1, and 039GW13DA1.

Methylene chloride was detected at 3 ug/L in the method blank VBLK4. Since this compound was not detected in associated sample 039GP02520, no action was taken.

Equipment Rinsate Blank:

Acetone and chloroform were detected at 32 ug/L and 9 ug/L, respectively, in equipment rinsate blank 039EP03719. The positive detections of chloroform in associated samples 039GP02711, 039GW041A1 and 039GW13DA1, which were less than 5X the blank amount, were flagged as undetected (U) with the quantitation limit being raised to the level of sample contamination. In addition, the positive detection of acetone in associated sample 039GP02520, which was less than 10X the blank amount, was flagged as undetected (U) with the quantitation limit being raised to the level of sample contamination.

Trip Blanks:

Methylene chloride and acetone were detected at 3 ug/L and 6 ug/L, respectively in trip blank 039TB13DA1. Qualification of acetone was previously performed based on the method and equipment rinsate blanks. The positive detections of methylene chloride in associated samples 039GW09DA1, 039GW09IA1 and 039GW13DA1, which were less than 10X the blank amount, were flagged as undetected (U) with the quantitation limit being raised to the level of sample contamination.

Chloroform was detected at 2 ug/L and 1 ug/L, respectively, in trip blanks 039TP02520 and 039TP03719. Qualification of chloroform was previously performed based on the equipment rinsate blank. No further action was necessary.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was required.

VI.) Laboratory Control Samples (LCS):

Eight LCS's were analyzed in this SDG. All criteria were met. No action was taken.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

All MS / MSD criteria were met, so no action was taken.

VIII.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was taken.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
SERVICE ORDER NUMBER: 0144
CONTRACTED LAB: Southwest Laboratory of Oklahoma, Inc.
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3-90
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994
SAMPLE MATRIX: Water
TYPES OF ANALYSES: Volatile Organics, Semivolatile Organics
SDG NUMBERS: 27181 (Level III)

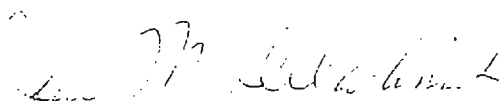
SAMPLES:

Client	Lab		Volatile	Semivolatile
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Organics</u>	<u>Organics</u>
PVTGW00101	27181.01	Water	X	X
PVTGW001AP	27181.02	Water	X	
PVTTW00101	27181.02	Water	X	

TW = TRIP BLANK

DATA REVIEWER(S): Linda H. Liu, Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Southwest Laboratory of Oklahoma, Inc. - 27181, CLP Organics

SAMPLES: PVTGW00101, PVTGW001AP, PVTTW00101

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviations (%RSD's) exceeded the 30% QC limit for the initial calibration analyzed on 09/24/96 on instrument N for following compounds:

bromomethane	50.3%
chloroethane	46.1%
acetone	40.9%
2-butanone	42.2%

There were no positive results for these compounds in the associated samples, so no action was taken.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 10/04/96 at 15:17 on instrument N for the following compounds:

carbon disulfide	29.6%
vinyl acetate	33.3%

The results for these compounds in associated samples PVTGW00101 and PVTGW001AP, which consisted entirely of non-detects, were flagged as estimated (UJ).

IV.) Blanks:

Method Blank:

There were no positive detections in the method blank. No action was taken.

Trip Blank:

Chloroform was detected at 2 ug/L in the trip blank PVTTW00101. Since chloroform was not detected in the associated samples, no action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was required.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD samples were not designated in this SDG. No action was taken.

VII.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was taken.

VIII.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was required.

IX.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

X.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XI.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XII.) System Performance:

All System Performance criteria were met. No action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

SEMIVOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviations (%RSD's) exceeded the 30% QC limit for the initial calibration analyzed on 10/14/96 on instrument M for following compound:

butylbenzylphthalate	32.9%
bis(2-ethylhexyl)phthalate	33.1%

There were no positive results for these compounds in the associated sample, so no action was taken.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 10/21/96 at 12:53 on instrument M for the following compounds:

hexachlorocyclopentadiene	56.3%
2,4-dinitrophenol	43.3%
4,6-dinitro-2-methylphenol	33.5%
benzo(b)fluoranthene	27.4%

The results for these compounds in associated sample PVTGW00101, which consisted entirely of non-detects, were flagged as estimated (UJ).

IV.) Blanks:

Bis(2-ethylhexyl)phthalate was detected at 1 ug/L in the method blank. Since this compound was not detected in the associated samples, no action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was required.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD samples were not designated in this SDG, so no action was taken.

MS / MSD samples were not designated in this SDG, so no action was taken.

VII.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was taken.

VIII.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was required.

IX.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

X.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XI.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XII.) System Performance:

All System Performance criteria were met. No action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: EnSafe/Allen & Hoshall
SITE NAME: Charleston Naval Base, Zone A
SERVICE ORDER NUMBER: 0148
CONTRACTED LAB: Southwest Laboratories of Oklahoma
EPA SOW/METHOD: EPA 8290
VALIDATION GUIDELINES: EPA 8290, Professional Judgement
SAMPLE MATRIX: Water
TYPES OF ANALYSES: 2,3,7,8-substituted PCDD's and PCDF's

SDG NUMBER: 27226

SAMPLES:

SDG 27226A (Level IV):

Client <u>Sample #</u>	Lab <u>Sample #</u>	<u>Matrix</u>	PCDD/ <u>PCDF</u>
039HW00304	27244.01	Water	X
506DW00104	27277.01	Water	X
506EW00104	27277.02	Water	X
506FW00104	27277.03	Water	X

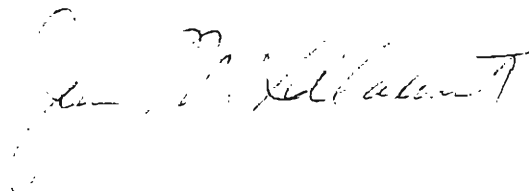
SDG 27226B (Level III):

Client <u>Sample #</u>	Lab <u>Sample #</u>	<u>Matrix</u>	PCDD/ <u>PCDF</u>
039GW00104	27226.01	Water	X
039GW00204	27243.01	Water	X
039GW00304	27243.02	Water	X
039GW00404	27257.01	Water	X
039GW00504	27257.03	Water	X
039GW00604	27276.01	Water	X
039GW00704	27296.01	Water	X
039GW00804	27296.02	Water	X
039GW00904	27296.03	Water	X
039GW01004	27296.04	Water	X
039GW04D04	27257.02	Water	X

DW = DEIONIZED WATER BLANK, E = EQUIPMENT RINSATE BLANK, F = FIELD BLANK

DATA REVIEWER(S): Shawn S. Lin, Ph.D., Jean M. Delashmit

RELEASE SIGNATURE:

A handwritten signature in black ink, appearing to read "Jean M. Delashmit". The signature is written in a cursive, flowing style with some loops and flourishes. It is positioned to the right of the "RELEASE SIGNATURE:" label.

DATA QUALIFICATION SUMMARY

Southwest Laboratories of Oklahoma - 27226A/B 2,3,7,8-substituted PCDD's and PCDF's

SAMPLES: 039HW00304, 506DW00104, 506EW00104, 506FW00104, 039GW00104,
039GW00204, 039GW00304, 039GW00404, 039GW00504, 039GW00604,
039GW00704, 039GW00804, 039GW00904, 039GW01004, 039GW04D04

2,3,7,8-SUBSTITUTED PCDD'S AND PCDF'S

I.) Holding Times:

All criteria were met, so no action was taken.

II.) HRGC/HRMS System Performance

GC Column Performance:

All criteria were met, so no action was taken.

HRMS Resolution:

All criteria were met, so no action was required.

Mass Verification:

All criteria were met, so no action was taken.

MS Data Acquisition:

All criteria were met, so no action was taken.

III.) Calibration:

Calibration Range:

EPA Method 1613A calibration and internal standard concentration levels were used for the analyses. Comparing to EPA Method 8290, the calibration ranges of the two methods were not significantly different, so no action was deemed necessary.

Initial Calibration:

All criteria were met, so no action was taken.

Calibration Verifications:

All criteria were met, so no action was taken.

IV.) Blanks

Method Blanks:

Several 2,3,7,8-substituted PCDD's and PCDF's were detected in the method blanks at the following highest concentrations:

<u>Method Blank</u>	<u>Compound</u>	<u>Conc.</u> <u>pg/L</u>	<u>Action Level</u> <u>pg/L</u>
DFBLK4A	1234678HpCDD	11	55
DFBLK4A	OCDD	205	1025
DFBLK1	234678-HxCDF	2.6	13
DFBLK1	1234678-HpCDF	3.5	18
DFBLK1	OCDF	2.9	15

Detections of these compounds in the associated samples below 5X the blank amounts were designated as Estimated Maximum Possible Concentration (EMPC).

Field Blanks:

Deionized water blank 506DW00104, equipment rinsate blank 506EW00104 and field blank 506FW00104, collected on 10/10/96, were analyzed. Three 2,3,7,8-substituted PCDD's and PCDF's were detected in the blanks at the following highest concentrations:

<u>Field Blank</u>	<u>Compound</u>	<u>Conc.</u> <u>pg/L</u>	<u>Action Level</u> <u>pg/L</u>
506FW00104	1234678-HpCDD	7.5	38
506FW00104	OCDD	45	225
506FW00104	1234678-HpCDF	2.1	11

Detections of these compounds in the associated samples below 5X the blank amounts were designated as Estimated Maximum Possible Concentration (EMPC).

V.) Internal Standards Performance:

All criteria were met, so no action was taken.

VI.) Spike/Spike Duplicates:

No MS/MSD samples were analyzed in this SDG. No action was required.

VII.) Duplicates:

Field duplicate set 039HW00304 / 039GW00304 was analyzed. There were no calculable Relative

Percent Differences (RPD's) for this set of field duplicate samples, so no action was required.

VIII.) PCDD/PCDF Identifications:

Retention Times:

All criteria were met, so no action was taken.

Ion Abundance:

All criteria were met, so no action was taken.

S/N Ratio:

All criteria were met, so no action was taken.

PCDPE (Polychlorinated Diphenyl Ether) Interferences:

All criteria were met, so no action was taken.

Second Column Confirmation:

All criteria were met, so no action was taken.

IX.) Overall Assessment of Data/General:

All data were acceptable with qualifications. Laboratory "X" flags meaning "EMPC" were replaced with "EMPC" upon validation.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: EnSafe/Allen & Hoshall
SITE NAME: Charleston Naval Base, Zone A
SERVICE ORDER NUMBER: 0150
CONTRACTED LAB: Southwest Laboratories of Oklahoma
EPA SOW/METHOD: EPA 8290
VALIDATION GUIDELINES: EPA 8290, Professional Judgement
SAMPLE MATRIX: Water
TYPES OF ANALYSES: 2,3,7,8-substituted PCDD's and PCDF's

SDG NUMBER: 27324

SAMPLES:

SDG 27324A (Level IV):

Client	Lab		PCDD/ PCDF
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	
039HW01104	27325.01	Water	X
GDAH02D04	27362.01	Water	X

SDG 27324B (Level III):

Client	Lab		PCDD/ PCDF
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	
039DW12I04	27335.08	Water	X
039EW12I04	27335.09	Water	X
039FW12I04	27335.10	Water	X
039GW01104	27324.04	Water	X
039GW01204	27335.05	Water	X
039GW08D04	27324.03	Water	X
039GW12D04	27335.07	Water	X
039GW12I04	27335.06	Water	X
GDAGW00104	27324.01	Water	X
GDAGW00204	27361.01	Water	X
GDAGW00304	27335.01	Water	X
GDAGW01D04	27324.02	Water	X
GDAGW02D04	27361.02	Water	X

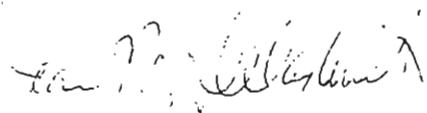
Client	Lab		PCDD/
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>PCDF</u>
GDAGW03D04	27335.02	Water	X
GDAGW03D04MS	27335.03	Water	+
GDAGW03D04MSD	27335.04	Water	+

+ = Non-billable Analysis

DW = DEIONIZED WATER BLANK, E = EQUIPMENT RINSATE BLANK, F = FIELD BLANK,
H = FIELD DUPLICATE SAMPLE, MS = MATRIX SPIKE, MSD = MATRIX SPIKE DUPLICATE

DATA REVIEWER(S): Shawn S. Lin, Ph.D., Jean M. Delashmit

RELEASE SIGNATURE:



DATA QUALIFICATION SUMMARY

Southwest Laboratories of Oklahoma - 27324A/B 2,3,7,8-substituted PCDD's and PCDF's

SAMPLES: 039HW01104, GDAHW02D04, 039DW12I04, 039EW12I04, 039FW12I04,
039GW01104, 039GW01204, 039GW08D04, 039GW12I04, 039GW12D04,
GDAGW00104, GDAGW00204, GDAGW00304, GDAGW01D04,
GDAGW02D04, GDAGW03D04, GDAGW03D04MS, GDAGW03D04MSD

2,3,7,8-SUBSTITUTED PCDD'S AND PCDF'S

I.) Holding Times:

All criteria were met, so no action was taken.

II.) HRGC/HRMS System Performance

GC Column Performance:

All criteria were met, so no action was taken.

HRMS Resolution:

All criteria were met, so no action was required.

Mass Verification:

All criteria were met, so no action was taken.

MS Data Acquisition:

All criteria were met, so no action was taken.

III.) Calibration:

Calibration Range:

EPA Method 1613A calibration and internal standard concentration levels were used for the analyses. Comparing to EPA Method 8290, the calibration ranges of the two methods were not significantly different, so no action was deemed necessary.

Initial Calibration:

All criteria were met, so no action was taken.

Calibration Verifications:

All criteria were met, so no action was taken.

IV.) Blanks

Method Blanks:

Several 2,3,7,8-substituted PCDD's and PCDF's were detected in the method blanks at the following highest concentrations:

<u>Method Blank</u>	<u>Compound</u>	<u>Conc.</u>	<u>Action Level</u>
DFBLK2	OCDD	23 pg/L	115 pg/L
DFBLK1	OCDF	5.5 pg/L	28 pg/L

Detections of these compounds in the associated samples below 5X the blank amounts were designated as Estimated Maximum Possible Concentration (EMPC).

Field Blanks:

Deionized water blank 039DW12I04, equipment rinsate blank 039EW12I04 and field blank 039FW12I04, collected on 10/16/96, were analyzed. OCDD was detected in the blanks at the following highest concentration:

<u>Field Blank</u>	<u>Compound</u>	<u>Conc.</u>	<u>Action Level</u>
039DW12I04	OCDD	11 pg/L	55 pg/L

Detections of OCDD in the associated samples were previously qualified based on method blank contamination. No further action was required.

V.) Internal Standards Performance:

All criteria were met, so no action was taken.

VI.) Spike/Spike Duplicates (MS/MSD):

MS/MSD set GDAGW03D04MS / GDAGW03D04MSD was analyzed. All criteria were met, so no action was taken.

VII.) Duplicates:

Two sets of field duplicates, 039GW01104 / 039HW01104 and GDAGW02D04 / GDAHW02D04, were analyzed. There were no calculable Relative Percent Differences (RPD's) for these two sets of field duplicate samples. No action was required.

VIII.) PCDD/PCDF Identifications:

Retention Times:

All criteria were met, so no action was taken.

Ion Abundance:

All criteria were met, so no action was taken.

S/N Ratio:

All criteria were met, so no action was taken.

PCDPE (Polychlorinated Diphenyl Ether) Interferences:

All criteria were met, so no action was taken.

Second Column Confirmation:

All criteria were met, so no action was taken.

IX.) Overall Assessment of Data/General:

All data were acceptable with qualifications. Laboratory "X" flags meaning "EMPC" were replaced with "EMPC" upon validation.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe / Allen & Hoshall
SITE NAME: Charleston Naval Base, Zone A
SERVICE ORDER NUMBER: 0147
CONTRACTED LAB: Southwest Laboratories of Oklahoma, Inc.
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3-90 or SW-846
VALIDATION GUIDELINES: *USEPA CLP National Functional Guidelines for Organic Data Review, 1994*
SAMPLE MATRIX: Water
TYPES OF ANALYSIS: Volatile Organics
SDG NUMBER: 27363 (Level III)

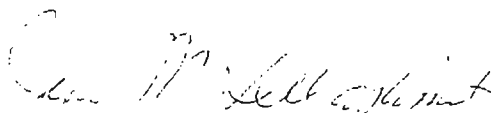
SAMPLES:

Client	Lab		Volatile
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Organics</u>
PVTGW00102	27363.01	Water	X
PVTGW00201	27363.02	Water	X
PVTTW00201	27363.03	Water	X

TW = TRIP BLANK

DATA REVIEWER(S): Amy L. Hogan, Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Southwest Laboratories of Oklahoma, Inc. - 27363 CLP Organics and Inorganics

SAMPLES: PVTGW00102, PVTGW00201, PVTTW00201

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met. No action was necessary.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met. No action was required.

Continuing Calibration:

The Percent Difference (%D) exceeded the 25% QC limit for the standard analyzed on 10/22/96 at 08:47 for chloroethane (31.1%). The results for this compound in associated samples PVTGW00102 and PVTGW00201, which were both non-detects, were flagged as estimated (UJ).

IV.) Blanks:

Method Blank:

There were no positive detections in the method blank. No action was required.

Trip Blank:

Chloroform was detected at 15 ug/L in trip blank PVTTW00201. Since this compound was not detected in the two associated samples, no action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD analyses were not performed in this SDG. No action was necessary.

VII.) Laboratory Control Samples (LCS):

One LCS was analyzed in this SDG. All Percent Recovery criteria were met. No action was taken.

VIII.) Field Duplicates:

There were no field duplicate samples identified in this SDG. No action was required.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe / Allen & Hoshall
SITE NAME: Charleston Naval Base, Zone A
SERVICE ORDER NUMBER: 0212
CONTRACTED LAB: Southwest Laboratories of Oklahoma, Inc.
QA/QC LEVEL: EPA Level III
EPA METHODS: EPA SOW 3-90 / SW-846
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994; USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994

SAMPLE MATRIX: Water
TYPES OF ANALYSES: Volatile Organics, Semivolatile Organics, Pesticides/PCB's, Total Metals, Cyanide

SDG NUMBER: 28417 (Level III)

SAMPLES:

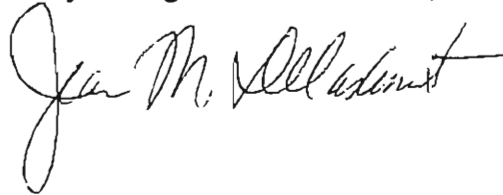
Client <u>Sample #</u>	Lab <u>Sample #</u>	<u>Matrix</u>	<u>Volatile Organics</u>	<u>Semi- volatiles</u>	<u>Pesticides/ PCB's</u>	<u>Total Metals</u>
039GW01301	28435.01	Water	X	X	X	X
039GW01401	28417.01	Water	X	X	X	X
039GW01501	28417.03	Water	X	X	X	X
039GW14D01	28417.02	Water	X	X	X	X
039GW15D01	28417.04	Water	X	X	X	X
043GW00101	28435.02	Water	X	X	X	X
043DW00101	28435.04	Water	X	X	X	X
043EW00101	28435.03	Water	X	X	X	X
039TW15D01	28417.05	Water	X			
043TW00101	28435.05	Water	X			
039GW01301MS	28435.01MS	Water	+			
039GW01301MSD	28435.01MSD	Water	+			

Client <u>Sample #</u>	Lab <u>Sample #</u>	<u>Matrix</u>	<u>Cyanide</u>
039GW01301	28435.01	Water	X
039GW01401	28417.01	Water	X
039GW01501	28417.03	Water	X
039GW14D01	28417.02	Water	X
039GW15D01	28417.04	Water	X
043GW00101	28435.02	Water	X
043DW00101	28435.04	Water	X
043EW00101	28435.03	Water	X

DW = DEIONIZED RINSATE BLANK, EW = EQUIPMENT RINSATE BLANK, MS = MATRIX SPIKE, MSD= MATRIX SPIKE DUPLICATE, T = TRIP BLANK

DATA REVIEWER(S): Amy L. Hogan, Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Southwest Laboratories of Oklahoma, Inc. - 28417 CLP Organics and Inorganics

SAMPLES: 039GW01301, 039GW01401, 039GW01501, 039GW14D01, 039GW15D01,
043GW00101, 043DW00101, 043EW00101, 039TW15D01, 043TW00101,
039GW01301MS, 039GW01301MSD

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met. No action was required.

Continuing Calibration:

The Percent Difference (%D) exceeded the 25% QC limit for the standard analyzed on 2/10/97 at 10:55 on instrument N for bromoform (43.2%). The results for this compound in the associated samples, which consisted entirely of non-detects, were flagged as estimated (UJ). The associated samples were 039GW14D01, 039GW01501 and 039GW15D01.

The Percent Difference (%D) exceeded the 25% QC limit for the standard analyzed on 2/11/97 at 10:24 on instrument N for carbon disulfide (30.3%). The results for this compound in the associated samples, which consisted entirely of non-detects, were flagged as estimated (UJ). The associated samples were 039GW01401, 039GW01301 and 043GW00101.

IV.) Blanks:

Method Blank:

There were no positive detections in the method blank. No action was required.

Trip Blanks:

There were no positive detections in the trip blanks. No action was required.

Deionized Water and Equipment Rinsate Blanks:

Chloroform was detected at 2 ug/L each in deionized water blank 043DW00101 and equipment rinsate blank 043EW00101. There were no positive results for this compound in the associated samples, so no action was required.

Tentatively Identified Compounds (TIC's):

There were no TIC's detected in the method, field or trip blanks. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was required.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

All MS / MSD criteria were met. No action was required.

VII.) Laboratory Control Samples (LCS):

Two LCS's were analyzed for this SDG. One Percent Recovery was outside the QC limits. Data validation action based on LCS criteria was not required. No action was taken.

VIII.) Field Duplicates:

There were no field duplicate samples identified in this SDG. No action was required.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met. No action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

SEMIVOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviation (%RSD) exceeded the QC limits for the standards analyzed on 2/13/97 on instrument P for hexachlorocyclopentadiene (49.7%). There were no positive results for this compound in the associated samples. No action was required.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the standards analyzed on 2/18/97 at 10:34 on instrument P for the following compounds.

4-nitrophenol	27.9%
indeno(1,2,3-cd)pyrene	40.1%
dibenz(a,h)anthracene	39.8%
benzo(g,h,i)perylene	39.5%

Since the only associated sample was a method blank, no action was required.

The Percent Difference (%D) exceeded the 25% QC limit for the standard analyzed on 2/11/97 at 08:59 on instrument S for 3,3'-dichlorobenzidine (28.0%). The results for this compound in the associated samples, which consisted entirely of non-detects, were flagged as estimated (UJ). The associated samples were 039GW01401, 039GW14D01, 039GW01501 and 039GW15D01.

IV.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was required.

Deionized Water and Equipment Rinsate Blanks:

There were no detections in the deionized water blank. Bis(2-ethylhexyl)phthalate was detected at 3 ug/L in equipment rinsate blank 043EW00101. All positive results for this compound in associated samples 039GW01301, 039GW01401 and 039GW15D01, which were less than 10X the blank amount, were flagged as undetected (U) with the results less than the CRQL being raised to the CRQL.

Tentatively Identified Compounds (TIC's):

There were no TIC's detected in the method or field blanks. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD analyses were not performed in this fraction of the SDG. No action was required.

VII.) Laboratory Control Samples (LCS):

Two LCS's were analyzed for this SDG. All LCS Recovery criteria were met. No action was taken.

VIII.) Field Duplicates:

There were no field duplicate samples identified in this SDG. No action was required.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

PESTICIDES/PCB's

I.) Holding Times:

All Holding Time criteria were met, so no action was required.

II.) Instrument Performance:

All Instrument Performance criteria were met. No action was required.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met. No action was required.

Continuing Calibration:

The Percent Difference (%D) exceeded the 25% QC limit for the standards analyzed on 2/12/97 at 02:26 on the primary column for endrin aldehyde (36.0%). The results for this compound in the associated samples, which consisted entirely of non-detects, were flagged as estimated (UJ). The associated samples were 039GW01401, 039GW14D01, 039GW01501 and 039GW15D01.

The Percent Difference (%D) exceeded the 25% QC limit for the standards analyzed on 2/12/97 at 18:03 on the primary column for dieldrin (26.4%). The non-detect results for this compound in associated samples 039GW01301 and 043GW00101 were flagged as estimated (UJ).

IV.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was required.

Deionized Water and Equipment Rinsate Blanks:

There were no positive detections in the two field blanks. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD analyses were not performed in this fraction of the SDG. No action was required.

VII.) TCL Compound Identification:

Pesticide/PCB Identification Summary (PIS):

All PIS Identification criteria were met. No action was required.

VIII.) Field Duplicates:

There were no field duplicate samples identified in this SDG. No action was necessary.

IX.) Pesticide Cleanup Check:

Florisil Cartridge Check:

All criteria were met, so no action was taken.

Gel Permeation Chromatography (GPC):

All GPC criteria were met. No action was necessary.

X.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

TOTAL METALS AND CYANIDE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was necessary.

III.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

Blank Type/ID#	Analyte	Max. Conc.	Action Level
CCB3	antimony	4.00 ug/L	20.0 ug/L
CCB3	beryllium	0.60 ug/L	3.00 ug/L
043DW00101	copper	1.10 ug/L	5.50 ug/L
ICB	magnesium	288 ug/L	1440 ug/L
043DW00101	thallium	3.30 ug/L	16.5 ug/L
043EW00101	zinc	11.0 ug/L	55.0 ug/L

CCB = Continuing Calibration Blank, ICB = Initial Calibration Blank,
043DW00101 = Deionized Blank, 043EW00101 = Equipment Rinsate Blank

All results greater than the IDL but less than 5X the blank amounts (Action Level, ug/L for water samples) for which the contaminated blank was an associated calibration, deionized water or equipment rinsate blank were flagged as undetected (U).

There were no analytes having negative results with absolute values greater than the IDL in this SDG. No action was required.

IV.) ICP Interference Check Sample Results:

All Percent Recovery criteria were met, so no action was taken.

The following analytes were detected in ICS Solution A at concentrations greater than the IDL:

arsenic	5 ug/L
copper	5 ug/L
lead	4 ug/L
nickel	1 ug/L
selenium	5 ug/L
thallium	10 ug/L

These analytes should not be present. Since neither aluminum, calcium, iron nor magnesium was present in the samples at a concentration comparable to or greater than the amount in Solution A, no action was required.

A negative result was observed in ICS Solution A at an absolute concentration greater than the IDL for cadmium (-1 ug/L). Since neither aluminum, calcium, iron nor magnesium was present in the samples at a concentration comparable to or greater than the amount in Solution A, no action was required.

V.) ICP Serial Dilution Analysis:

All Serial Dilution Analysis criteria were met. No action was required.

VI.) Laboratory Control Samples (LCS):

All LCS Recovery criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was required.

VIII.) Matrix Spike Recoveries:

Matrix Spike Analysis was not performed in this fraction of the SDG. No action was required.

IX.) Field Duplicates:

There were no field duplicate samples identified in this SDG. No action was required.

X.) Graphite Furnace Atomic Absorption QC (GFAA):

Graphite Furnace analyses were not used for the samples in this SDG. No action was taken.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was required.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria were met, so no action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

VALIDATA

Chemical Services, Inc.

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(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: EnSafe/Allen & Hoshall
SITE NAME: Charleston Naval Base, Zone A
SERVICE ORDER NUMBER: 0223
CONTRACTED LAB: Southwest Laboratories of Oklahoma, Inc.
EPA SOW/METHOD: EPA 8290
VALIDATION GUIDELINES: EPA 8290, Professional Judgement
SAMPLE MATRIX: Water
TYPES OF ANALYSES: 2,3,7,8-substituted PCDD's and PCDF's

SDG NUMBER: 28773

SAMPLES:

SDG 28773A (Level IV):

Client	Lab		PCDD/ PCDF
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	
039DW008A2	28774.01	Water	X
039EW008A2	28774.02	Water	X
039FW008A2	28774.03	Water	X
039HW010A2	28786.01	Water	X

SDG 28773B (Level III):

Client	Lab		PCDD/ PCDF
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	
039GW008A2	28773.04	Water	X
039GW009A2	28773.02	Water	X
039GW010A2	28785.03	Water	X
039GW012A2	28809.01	Water	X
039GW013A2	28809.03	Water	X
039GW08DA2	28773.03	Water	X
039GW09DA2	28785.02	Water	X
039GW09IA2	28773.01	Water	X

Client	Lab		PCDD/
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>PCDF</u>
039GW10DA2	28785.05	Water	X
039GW10IA2	28785.04	Water	X
039GW12DA2	28809.02	Water	X
039GW12IA2	28785.01	Water	X
039GW13DA2	28809.05	Water	X
039GW13IA2	28809.04	Water	X

D =DEIONIZED WATER BLANK, E = EQUIPMENT RINSATE BLANK, F = FIELD BLANK

DATA REVIEWER(S): Shawn S. Lin, Ph.D., Jean M. Delashmit

RELEASE SIGNATURE:

DATA QUALIFICATION SUMMARY

Southwest Laboratories of Oklahoma - 28773A/B 2,3,7,8-substituted PCDD's and PCDF's

SAMPLES: 039DW008A2, 039EW008A2, 039FW008A2, 039HW010A2, 039GW008A2,
039GW009A2, 039GW010A2, 039GW012A2, 039GW013A2, 039GW08DA2,
039GW09DA2, 039GW09IA2, 039GW10DA2, 039GW10IA2, 039GW12DA2,
039GW12IA2, 039GW13DA2, 039GW13IA2

2,3,7,8-SUBSTITUTED PCDD'S AND PCDF'S

I.) Holding Times:

All criteria were met, so no action was taken.

II.) HRGC/HRMS System Performance:

GC Column Performance:

All criteria were met, so no action was taken.

HRMS Resolution:

All criteria were met, so no action was required.

Mass Verification:

All criteria were met, so no action was taken.

MS Data Acquisition:

All criteria were met, so no action was taken.

III.) Calibration:

Calibration Range:

All criteria were met, so no action was taken.

Initial Calibration:

All criteria were met, so no action was taken.

Calibration Verifications:

All criteria were met, so no action was taken.

IV.) Blanks

Method Blanks:

Several 2,3,7,8-substituted PCDD's and PCDF's were detected in the method blanks at the following highest concentrations:

<u>Method Blank</u>	<u>Compound</u>	Conc. <u>pg/L</u>	Action Level <u>pg/L</u>
DFBLK3	1234678-HpCDD	4.5	23
DFBLK1	OCDD	34	170
DFBLK1	1234678-HpCDF	2.3	12

Detections of these compounds in the associated samples below 5X the blank amounts were designated as Estimated Maximum Possible Concentration (EMPC).

Field Blanks:

Deionized water blank 039DW008A2, equipment rinsate blank 039EW008A2 and field blank 039FW008A2 collected on 3/10/97 were analyzed. Several 2,3,7,8-substituted PCDD's and PCDF's were detected in the blanks at the following highest concentration:

<u>Field Blank</u>	<u>Compound</u>	Conc. <u>pg/L</u>	Action Level <u>pg/L</u>
039FW008A2	1234678-HpCDD	3.7	19
039EW008A2	OCDD	8.1	41
039DW008A2	1234678-HpCDF	1.4	7

Detections of these compounds in the associated samples below 5X the blank amounts were designated as Estimated Maximum Possible Concentration (EMPC).

V.) Internal Standards Performance:

All criteria were met, so no action was taken.

VI.) Spike/Spike Duplicates:

No MS/MSD samples were analyzed.

VII.) Duplicates:

One set of field duplicates, 039GW010A2 / 039HW010A2, was analyzed. There were no calculable Relative Percent Differences (RPD's) for this set of field duplicate samples, so no action was required.

VIII.) PCDD/PCDF Identifications:

Retention Times:

All criteria were met, so no action was taken.

Ion Abundance:

All criteria were met, so no action was taken.

S/N Ratio:

All criteria were met, so no action was taken.

PCDPE (Polychlorinated Diphenyl Ether) Interferences:

All criteria were met, so no action was taken.

Second Column Confirmation:

All criteria were met, so no action was taken.

IX.) Overall Assessment of Data/General:

All data were acceptable with qualifications. Laboratory "X" flags meaning "EMPC" were replaced with "EMPC" upon validation.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe / Allen & Hoshall
SITE NAME: Charleston Naval Base, Zone A
SERVICE ORDER NUMBER: 0223
CONTRACTED LAB: Southwest Laboratories of Oklahoma, Inc.
QA/QC LEVELS: EPA Level III / IV
EPA METHODS: EPA SOW 3-90 / SW-846
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994; USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994

SAMPLE MATRIX: Water
TYPES OF ANALYSES: Volatile Organics, Semivolatile Organics, Total Metals, Total Petroleum Hydrocarbons - Gasoline Range (TRPH-GRO), Total Petroleum Hydrocarbons - Diesel Range (TRPH-DRO), Chlorides, Sulfates, Total Dissolved Solids (TDS)

SDG NUMBERS: 28773A (Appendix IX, Level IV)
28773B (Level III)

SAMPLES:

SDG 28773A (Level IV):

Client	Lab		Volatile	Semi-	Total	TRPH-
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Organics</u>	<u>volatiles</u>	<u>Metals</u>	<u>GRO</u>
039HW010A2*	28786.01	Water	X	X	X	X
039DW008A2	28774.01	Water	X	X	X	X
039EW008A2	28774.02	Water	X	X	X	X
039FW008A2	28774.03	Water	X	X	X	X

Client	Lab		TRPH-			
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>DRO</u>	<u>Chlorides</u>	<u>Sulfates</u>	<u>TDS</u>
039HW010A2*	28786.01	Water	X	X	X	X
039DW008A2	28774.01	Water	X	X	X	X
039EW008A2	28774.02	Water	X	X	X	X
039FW008A2	28774.03	Water	X	X	X	X

* = Corresponding sample 039GW010A2 was analyzed in SDG 28773B.

DW = DEIONIZED WATER BLANK, EW = EQUIPMENT RINSATE BLANK, FW = FIELD BLANK, H = FIELD DUPLICATE

SDG 28773B (Level III):

Client	Lab		Volatile	Semi-	Total	TRPH-
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Organics</u>	<u>volatiles</u>	<u>Metals</u>	<u>GRO</u>
039GW008A2	28773.04	Water	X	X	X	X
039GW009A2	28773.02	Water	X	X	X	X
039GW010A2*	28785.03	Water	X	X	X	X
039GW012A2	28809.01	Water	X	X	X	X
039GW013A2	28809.03	Water	X	X	X	X
039GW08DA2	28773.03	Water	X	X	X	X
039GW08DA2RE	28773.03RE	Water		+		
039GW09DA2	28785.02	Water	X	X	X	X
039GW09IA2	28773.01	Water	X	X	X	X
039GW10DA2	28785.05	Water	X	X	X	X
039GW10IA2	28785.04	Water	X	X	X	X
039GW10IA2RE	28785.04RE	Water		+		
039GW12DA2	28809.02	Water	X	X	X	X
039GW12IA2	28785.01	Water	X	X	X	X
039GW12IA2DL	28785.01DL	Water	+			
039GW13DA2	28809.05	Water	X	X	X	X
039GW13IA2	28809.04	Water	X	X	X	X
039TW008A2	28773.05	Water	X			
039TW010A2	28785.06	Water	X			
039TW13DA2	28809.06	Water	X			
039GW09IA2MS	28773.01MS	Water	+			
039GW09IA2MSD	28773.01MSD	Water	+			
039GW10DA2MS	28785.05MS	Water	+			
039GW10DA2MSD	28785.05MSD	Water	+			

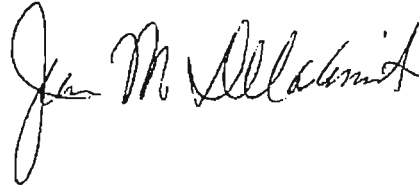
Client	Lab		TRPH-			
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>DRO</u>	<u>Chlorides</u>	<u>Sulfates</u>	<u>TDS</u>
039GW008A2	28773.04	Water	X	X	X	X
039GW009A2	28773.02	Water	X	X	X	X
039GW010A2*	28785.03	Water	X	X	X	X
039GW012A2	28809.01	Water	X	X	X	X
039GW013A2	28809.03	Water	X	X	X	X
039GW08DA2	28773.03	Water	X	X	X	X
039GW09DA2	28785.02	Water	X	X	X	X
039GW09IA2	28773.01	Water	X	X	X	X
039GW10DA2	28785.05	Water	X	X	X	X
039GW10IA2	28785.04	Water	X	X	X	X
039GW12DA2	28809.02	Water	X	X	X	X
039GW12IA2	28785.01	Water	X	X	X	X
039GW13DA2	28809.05	Water	X	X	X	X
039GW13IA2	28809.04	Water	X	X	X	X

* = Corresponding duplicate sample 039HW010A2 was analyzed in SDG 28773A.
+ = Non-billable analysis

DL = DILUTION, MS = MATRIX SPIKE, MSD = MATRIX SPIKE DUPLICATE,
RE = REANALYSIS, T = TRIP BLANK

DATA REVIEWER(S): Amy L. Hogan, Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:

A handwritten signature in black ink, appearing to read "Jean M. Delashmit". The signature is written in a cursive, flowing style with a large initial "J" and "M".

Data Qualifier Definitions

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Southwest Laboratories of Oklahoma, Inc. - 28773 Appendix IX Organics & Inorganics

SAMPLES: 039HW010A2, 039DW008A2, 039EW008A2, 039FW008A2

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

The average Relative Response Factors (RRF's) were below the 0.050 QC limit for the standards analyzed on 2/12/97 on instrument R for the following compounds:

acetonitrile	0.032
isobutyl alcohol	0.009
1,4-dioxane	0.002

The results for these compounds in the associated samples, which consisted entirely of non-detects, were rejected (R). The associated samples were 039HW010A2 and field blanks 039DW008A2, 039EW008A2 and 039FW008A2.

The Percent Relative Standard Deviations (%RSD's) exceeded the 30% QC limit for the standards analyzed on 2/12/97 on instrument R for the following compounds:

chloroethane	36.7%
2-chloroethyl vinyl ether	39.3%
isobutyl alcohol	63.4%
1,4-dioxane	31.6%
dichlorodifluoromethane	36.4%

There were no positive results for these compounds in the associated samples, so no action was required.

Continuing Calibration:

The Relative Response Factors (RRF's) for the standards analyzed on 3/12/97 at 10:28 on instrument R were below the 0.050 QC limit for the following compounds:

acetonitrile	0.030
isobutyl alcohol	0.008
1,4-dioxane	0.002

The results for these compounds in the associated field blank were previously rejected based on the initial calibration. No further action was required.

The Percent Differences (%D's) exceeded the 25% QC limit for the standards analyzed on 3/12/97 at 10:28 on instrument R for the following compounds:

acetone	26.7%
acrolein	39.1%
2-chloroethyl vinyl ether	37.5%
dichlorodifluoromethane	58.7%

The associated samples were field blanks. No action was required.

The Relative Response Factors (RRF's) for the standards analyzed on 3/13/97 at 10:40 on instrument R were below the 0.050 QC limit for the following compounds:

acetonitrile	0.030
isobutyl alcohol	0.009
1,4-dioxane	0.002

The results for these compounds in the associated sample were previously rejected based on the initial calibration. No further action was required.

The Percent Differences (%D's) exceeded the 25% QC limit for the standards analyzed on 3/13/97 at 10:40 on instrument R for the following compounds:

4-methyl-2-pentanone	25.2%
2-chloroethyl vinyl ether	56.2%
2-hexanone	25.1%
dichlorodifluoromethane	47.6%

The results for these compounds in associated sample 039HW010A2, which consisted entirely of non-detects, were flagged as estimated (UJ).

IV.) Blanks:

Method Blanks:

Acetone and methylene chloride were detected at 5 ug/L and 3 ug/L, respectively, in method

blank VBLK1. The associated samples were field blanks, so no action was required.

Acetone was detected at 10 ug/L in method blank VBLK2. There were no positive results for this compound in the associated sample, so no action was required.

Field Blanks:

Acetone and methylene chloride were detected at 10 ug/L and 3 ug/L, respectively, in deionized water blank 039DW008A2. Since there were no positive results for these compounds in the associated sample, no action was required.

Acetone and methylene chloride were detected at 6 ug/L and 3 ug/L, respectively, in equipment rinsate blank 039EW008A2. Since there were no positive results for these compounds in the associated sample, no action was required.

Trip Blanks:

There were no positive detections in the associated trip blanks (analyzed in SDG 28773B). No action was required.

TIC's:

There were no TIC's detected in the method, field or trip blanks. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD analyses were not performed for this fraction of the SDG. No action was required.

VII.) Laboratory Control Samples (LCS):

Two LCS's were analyzed for this SDG. All LCS Recovery criteria were met. No action was taken.

VIII.) Field Duplicates:

There were no calculable Relative Percent Differences (RPD's) for the field duplicate samples in this fraction of the SDG. No action was required.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

The non-detect results for acetonitrile, isobutyl alcohol and 1,4-dioxane were rejected in sample 039HW010A2 and field blanks 039DW008A2, 039EW008A2 and 039FW008A2 based on low RRF's in the initial calibration. All other laboratory data were acceptable with qualifications.

SEMIVOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

The average Relative Response Factors (RRF's) were below the 0.050 QC limit for the standards analyzed on 3/17/97 on instrument A for aramite (0.038) and hexachlorophene (0.037). The non-detect results for these compounds in associated sample 039HW010A2 and blanks 039DW008A2, 039EW008A2 and 039FW008A2 were rejected (R).

The Percent Relative Standard Deviations (%RSD's) exceeded the 30% QC limit for the standards analyzed on 3/17/97 on instrument A for the following compounds:

ethyl methanesulfonate	35.6%
2-picoline	31.0%
acetophenone	34.4%
n-nitrosopyrrolidine	34.2%
m-cresol	35.6%
n-nitrosomorpholine	33.6%
o-toluidine	34.8%

n-nitroso-piperidine	39.0%
o,o,o-triethyl phosphorothionate	35.5%
2,6-dichlorophenol	35.2%
hexachloropropene	36.7%
n-nitroso-di-n-butylamine	39.7%
1,2,4,5-tetrachlorobenzene	32.9%
safrole	33.9%
isosafrole	39.1%
1,4-naphthoquinone	35.6%
1,3-dinitrobenzene	42.2%
pentachlorobenzene	33.7%
1-naphthylamine	44.0%
4-nitroquinoline-1-oxide	47.5%
2-naphthylamine	36.8%
thionazin	45.5%
diphenylamine	35.7%
sulfotepp	38.2%
1,3,5-trinitrobenzene	46.7%
phorate	46.9%
phenacetin	45.8%
diallate	38.5%
dimethoate	44.3%
4-aminobiphenyl	40.9%
pronamide	46.0%
pentachloronitrobenzene	41.7%
disulfoton	46.0%
methyl parathion	43.1%
parathion	48.3%
methapyrilene	38.4%
isodrin	42.7%
chlorobenzilate	39.3%
3,3'-dimethylbenzidine	33.5%
kepone	46.4%
famphur	64.0%
7,12-dimethylbenz(a)anthracene	45.5%

These compounds were not detected in the associated sample. No action was required.

Continuing Calibration:

The Relative Response Factor (RRF) for aramite was 0.038 for the standard analyzed on 3/18/97 at 08:35 on instrument A, which was below the 0.050 QC limit. The results for this compound in associated sample and field blanks were previously rejected based on the initial calibration. No further action was required.

The Percent Differences (%D's) exceeded the 25% QC limit for the standards analyzed on 3/18/97 at 08:35 on instrument A for the following compounds:

bis(2-chloroethyl)ether	31.8%
2,2'-oxybis(1-chloropropane)	38.4%
2,6-dichlorophenol	86.4%
hexachloropropene	32.0%
pentachlorobenzene	46.6%
n-nitrosodimethylamine	26.2%
n-nitrosomethylethylamine	47.1%
n-nitrosodiethylamine	50.4%
ethyl methansulfonate	48.4%
2-picoline	53.1%
acetophenone	59.5%
n-nitrosopyrrolidine	39.9%
n-nitrosomorpholine	60.1%
o-toluidine	54.1%
n-nitroso-piperidine	40.6%
o,o,o-triethyl phosphorothionate	44.4%
n-nitrosodi-n-butylamine	44.9%
safrole	51.1%
isosafrole	58.6%
1,4-naphthoquinone	54.4%
1,3-dinitrobenzene	46.3%
1-naphthylamine	49.9%
2-naphthylamine	50.2%
thionazin	42.5%
phorate	42.1%
phenacetin	62.1%
diallate	34.4%
dimethoate	47.3%
4-aminobiphenyl	59.6%
pronamide	57.0%
pentachloronitrobenzene	69.0%
disulfoton	43.4%
methyl parathion	45.2%
parathion	52.0%
isodrin	60.2%
chlorobenzilate	36.9%
3,3'-dimethylbenzidine	28.2%
famphur	73.3%
m-cresol	52.4%
4-nitroquinoline-1-oxide	46.8%
diphenylamine	53.8%
sulfotepp	29.3%
kepone	52.8%
a,a-dimethylphenethylamine	31.7%

The results for these compounds in associated sample 039HW010A2, which consisted entirely of non-detects, were flagged as estimated (UJ).

IV.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was required.

Field Blanks:

Bis(2-ethylhexyl)phthalate was detected at 1 ug/L in deionized water blank 039DW008A2. The result for this compound in associated sample 039HW010A2, which was less than 10X the blank amount, was flagged as undetected (U) with the result, which was less than the CRQL, being raised to the CRQL.

TIC's:

There were no TIC's detected in the method or field blanks. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD analyses were not performed for this fraction of the SDG. No action was taken.

VII.) Laboratory Control Samples (LCS):

Two LCS's were analyzed for this SDG. Several Percent Recoveries (%R's) were outside the QC limits. Data validation action based on LCS criteria was not required. No action was taken.

VIII.) Field Duplicates:

There were no calculable Relative Percent Differences (RPD's) for the field duplicate samples in this fraction of the SDG. No action was required.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

The non-detect results for aramite and hexachlorophene in sample 039DW008A2 and field blanks 039EW008A2, 039FW008A2 and 039HW010A2 were rejected (R) based on the low Relative Response Factors in the Initial Calibration. All other laboratory data were acceptable with qualifications.

TOTAL RECOVERABLE PETROLEUM HYDROCARBONS - DIESEL RANGE (TRPH-DRO)

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was necessary.

Field Blanks:

There were no positive detections in the field blanks. No action was necessary.

IV.) Surrogates:

All Surrogate Recovery criteria were met. No action was required.

V.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

MS / MSD analyses were not performed for this fraction of the SDG. No action was required.

VII.) Field Duplicates:

There were no calculable Relative Percent Differences for the field duplicate samples in this fraction of the SDG. No action was required.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualifications.

TOTAL RECOVERABLE PETROLEUM HYDROCARBONS - GASOLINE RANGE (TRPH-GRO)

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was required.

III.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was necessary.

Field Blanks:

There were no positive detections in the field blanks. No action was necessary.

IV.) Surrogates:

All Surrogate Recovery criteria were met. No action was required.

V.) Laboratory Check Samples (LCS):

All LCS Recovery criteria were met. No action was necessary.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

MS / MSD analyses were not performed in this fraction of the SDG. No action was required.

VII.) Field Duplicates:

There were no calculable Relative Percent Differences for the field duplicate samples in this fraction of the SDG. No action was required.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualifications.

TOTAL METALS AND CYANIDE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was necessary.

III.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Max. Conc.</u>	<u>Action Level</u>
CCB2	arsenic	2.10 ug/L	10.5 ug/L
PBW	barium	0.36 ug/L	1.80 ug/L
039EW008A2	chromium	1.20 ug/L	6.00 ug/L
039EW008A2	nickel	1.00 ug/L	5.00 ug/L
CCB2	selenium	3.40 ug/L	17.0 ug/L
PBW	silver	1.65 ug/L	8.25 ug/L
039DW008A2	sodium	82.5 ug/L	412 ug/L

CCB = Continuing Calibration Blank, PBW = Preparation Blank (Water),
039DW008A2 = Deionized Water Blank, 039EW027A2 = Equipment Rinsate Blank

All results greater than the IDL but less than 5X the blank amounts (Action Level, ug/L for water samples) for which the contaminated blank was an associated calibration, preparation or field blank were flagged as undetected (U).

The following analyte had a negative result with an absolute value greater than the IDL:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Neg. Conc.</u>	<u>5X Conc.</u>
CCB2	antimony	-3.50 ug/L	17.5 ug/L

CCB = Continuing Calibration Blank

All associated positive sample results less than 5X the absolute value of the negative blank result and all associated non-detects were flagged as estimated (J) and (UJ).

IV.) ICP Interference Check Sample Results:

All Percent Recovery criteria were met, so no action was taken.

The following analytes were detected in ICS Solution A at concentrations greater than the IDL:

antimony	3 ug/L
cadmium	1 ug/L
chromium	3 ug/L
cobalt	1 ug/L
copper	2 ug/L
lead	2 ug/L
selenium	5 ug/L
silver	8 ug/L
thallium	8 ug/L

These analytes should not be present. Since neither aluminum, calcium, iron nor magnesium was present in the samples at a concentration comparable to or greater than the amount in Solution A, no action was required.

Negative results were observed in ICS Solution A at absolute concentrations greater than the IDL for the following analytes:

arsenic	-3 ug/L
barium	-1 ug/L
potassium	-199 ug/L

Since neither aluminum, calcium, iron nor magnesium was present in the samples at a concentration comparable to or greater than the amount in Solution A, no action was required.

V.) ICP Serial Dilution Analysis:

Serial dilution analysis was not performed in this fraction of the SDG. No action was required.

VI.) Laboratory Control Samples (LCS):

All LCS criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this fraction of the SDG. No action was required.

VIII.) Matrix Spike Recoveries:

Matrix Spike analysis was not performed in this fraction of the SDG. No action was required.

IX.) Field Duplicates:

One set of field duplicate samples, 039GW010A2 (analyzed in SDG 28773B) and 039HW010A2, was analyzed by the laboratory. The calculable Relative Percent Differences (RPD's) were:

Analyte	039GW010A2, ug/L	039HW010A2, ug/L	RPD
aluminum	778	778	0%
arsenic	63.7	62.9	1.3%
barium	24.1	24.9	3.3%
calcium	19300	20200	4.6%
iron	36300	37100	2.2%
magnesium	8290	8640	4.1%
manganese	95.5	98.9	3.5%
potassium	681	711	4.3%
sodium	5670	5840	3.0%

None of the Relative Percent Differences (RPD's) exceeded the 30% QC limit for water samples, so no action was required.

X.) Graphite Furnace Atomic Absorption QC (GFAA):

Graphite Furnace analyses were not used for the samples in this SDG. No action was taken.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was required.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria were met. No action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

CHLORIDES

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was necessary.

Field Blanks:

There were no positive detections in the field blanks. No action was required.

IV.) Laboratory Check Samples (LCS):

All LCS Recovery criteria were met. No action was necessary.

V.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

MS / MSD analyses were not performed in this fraction of the SDG. No action was required.

VI.) Field Duplicates:

The Relative Percent Difference (RPD) for chlorides in field duplicate samples 039GW010A2 (analyzed in SDG 28773B) and 039HW010A2 was 0%, which was less than the 30% QC limit for water samples. No action was required.

VII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

SULFATES

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blanks:

There were no detections in the method blanks. No action was necessary.

Field Blanks:

There were no detections in the field blanks. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Recovery criteria were met, so no action was necessary.

V.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

MS / MSD analyses were not performed in this fraction of the SDG. No action was required.

VI.) Field Duplicates:

The Relative Percent Difference (RPD) for sulfates in field duplicate samples 039GW010A2 (analyzed in SDG 28773B) and 039HW010A2 was 0%, which was less than the 30% QC limit for water samples. No action was required.

VII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

TOTAL DISSOLVED SOLIDS (TDS)

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was necessary.

Field Blanks:

There were no positive detections in the field blanks. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Recovery criteria were met, so no action was necessary.

V.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

MS / MSD analyses were not performed in this fraction of the SDG. No action was required.

VI.) Field Duplicates:

The Relative Percent Difference (RPD) for TDS in field duplicate samples 039GW010A2 (analyzed in SDG 28773B) and 039HW010A2 was 8.7%, which was less than the 30% QC limit for water samples. No action was required.

VII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

DATA QUALIFICATION SUMMARY

Southwest Laboratories of Oklahoma, Inc. - 28773 CLP Organics and Inorganics

SAMPLES: 039GW008A2, 039GW009A2, 039GW010A2, 039GW012A2, 039GW013A2,
039GW08DA2, 039GW08DA2RE, 039GW09DA2, 039GW09IA2, 039GW10DA2,
039GW10IA2, 039GW10IA2RE, 039GW12DA2, 039GW12IA2, 039GW12IA2DL,
039GW13DA2, 039GW13IA2, 039TW008A2, 039TW010A2, 039TW13DA2,
039GW09IA2MS, 039GW09IA2MSD, 039GW10DA2MS, 039GW10DA2MSD

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviations (%RSD's) exceeded the 30% QC limit for the standards analyzed on 3/11/97 on instrument N for the following compounds:

acetone	51.8%
2-butanone	54.0%
4-methyl-2-pentanone	31.5%
2-hexanone	34.0%

The positive result for 2-butanone in associated sample 039GW08DA2 was flagged as estimated (J). There were no positive results for the other compounds in the associated samples, so no further action was necessary.

Continuing Calibration:

The Relative Response Factor (RRF) for 2-chloroethyl vinyl ether was 0.042 for the standard analyzed on 3/12/97 at 11:17 on instrument N, which was below the 0.050 QC limit. The results for this compound in the associated samples, which consisted entirely of non-detects, were rejected (R). The associated samples were 039GW09IA2, 039GW009A2, 039GW08DA2, 039GW008A2 and trip blank 039TW008A2.

The Percent Difference (%D) exceeded the 25% QC limit for the standard analyzed on 3/13/97 at 10:17 on instrument N for 2-chloroethyl vinyl ether (79.6%). The results for this compound in the associated samples, which consisted entirely of non-detects, were flagged as estimated (UJ). The associated samples were 039GW12IA2, 039GW09DA2, 039GW010A2, 039GW10IA2, 039GW10DA2 and 039GW12IA2DL.

The Percent Differences (%D's) exceeded the 25% QC limit for the standards analyzed on 3/14/97 at 10:58 on instrument N for the following compounds:

2-chloroethyl vinyl ether	87.0%
bromoform	30.3%

The results for these compounds in the associated samples, which consisted entirely of non-detects, were flagged as estimated (UJ). The associated samples were 039GW012A2, 039GW12DA2, 039GW013A2 and 039GW13IA2.

IV.) Blanks:

Method Blanks:

Total xylene was detected at 1 ug/L in method blank VBLK1. There were no positive results for this compound in the associated samples. No action was required.

Field Blanks:

Acetone and methylene chloride were detected at 10 ug/L and 3 ug/L, respectively, in deionized water blank 039DW008A2 (analyzed in SDG 28773A). There were no positive results for these compounds in the associated samples. No action was required.

Acetone and methylene chloride were detected at 6 ug/L and 3 ug/L, respectively, in equipment rinsate blank 039EW008A2 (analyzed in SDG 28773A). There were no positive results for these compounds in the associated samples. No action was required.

Trip Blanks:

There were no positive detections in the trip blanks. No action was required.

TIC's:

There were no TIC's detected in the method, field or trip blanks. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

All MS / MSD criteria were met. No action was required.

VII.) Laboratory Control Samples (LCS):

Three LCS's were analyzed for this SDG. Several Percent Recoveries (%R's) exceeded the QC limits. Data validation action based on LCS Recovery criteria was not required. No action was taken.

VIII.) Field Duplicates:

There were no calculable Relative Percent Differences (RPD's) for the field duplicate samples in this fraction of the SDG. No action was required.

IX.) Internal Standards Performance (ISTD):

All ISTD criteria were met. No action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

The concentration of 1,2-dichloroethene (total) in sample 039GW12IA2 exceeded the standard calibration range. The concentration of this compound in the original analysis was replaced by the validator with the diluted sample (039GW12IA2) result with the appropriate qualifier (D). All other CRQL criteria were met. No further action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

The non-detect results for 2-chloroethyl vinyl ether in samples 039GW09IA2, 039GW009A2, 039GW08DA2, 039GW008A2 and 039TW008A2 were rejected based on a low RRF in the continuing calibration. All other laboratory data were acceptable with qualifications.

SEMIVOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met. No action was required.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the standards analyzed on 3/20/97 at 08:26 on instrument S for the following compounds:

4,6-dinitro-2-methylphenol	40.9%
2,4-dinitrophenol	45.4%

The results for these compounds in associated samples 039GW010A2, 039GW10IA2 and 039GW10DA2, which consisted entirely of non-detects, were flagged as estimated (UJ).

IV.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was required.

Field Blanks:

Bis(2-ethylhexyl)phthalate was detected at 1 ug/L in deionized water blank 039DW008A2 (analyzed in SDG 28773A). The results for this compound in the associated samples, which were less than 10X the blank amount, were flagged as undetected (U) with the results less than the CRQL being raised to the CRQL. The associated samples were 039GW010A2, 039GW08DA2, 039GW09IA2 and 039GW12IA2.

TIC's:

There were no TIC's detected in the method or field blanks. No action was required.

V.) Surrogate Recoveries:

The Surrogate Percent Recoveries (%R's) were below their QC limits for sample 039GW08DA2:

<u>Surrogate</u>	<u>%R</u>	<u>QC Limits</u>
phenol-d5	3	10-94%
2-fluorophenol	2	21-100%
2,4,6-tribromophenol	3	10-123%

The reanalysis of this sample yielded even lower Surrogate Recoveries. Since the %R's were less than 10%, all results in the acid compound fraction of this sample, which consisted entirely of non-detects, were rejected (R).

The Surrogate Percent Recoveries (%R's) were below their QC limits for sample 039GW10IA2:

<u>Surrogate</u>	<u>%R</u>	<u>QC Limits</u>
phenol-d5	9	10-94%
2-fluorophenol	10	21-100%
2,4,6-tribromophenol	7	10-123%

The reanalysis of this sample yielded even lower Surrogate Recoveries. Since the %R's were less than 10%, all results for the acid compound fraction of this sample, which consisted entirely of non-detects, were rejected (R).

The Surrogate Percent Recovery (%R) of 2-fluorophenol was 12% for sample 039GW012A2, which was below the 21-100% QC limits. Since only one surrogate was below the QC limits in the acid compound fraction, no action was required.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD analyses were not performed in this fraction of the SDG. No action was required.

VII.) Laboratory Control Samples (LCS):

Three LCS's were analyzed for this SDG. Several Percent Recoveries (%R's) were outside the QC limits. Data validation action based on LCS Recovery criteria was not required. No action was taken.

VIII.) Field Duplicates:

There were no calculable Relative Percent Differences (RPD's) for the field duplicate samples in this fraction in this SDG. No action was required.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met. No action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

The original analyses of samples 039GW08DA2 and 039GW10IA2 were considered by the validator to be of preferable data quality to the reanalyses because of better surrogate recoveries.

The non-detect results for the acid fraction compounds in samples 039GW08DA2 and 039GW10IA2 were rejected based on extremely low surrogate recoveries. All other laboratory data were acceptable with qualifications.

TOTAL RECOVERABLE PETROLEUM HYDROCARBONS - DIESEL RANGE (TRPH-DRO)

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was necessary.

Field Blanks:

There were no positive detections in the field blanks, which were analyzed in SDG 28773A. No action was necessary.

IV.) Surrogates:

All Surrogate Recovery criteria were met. No action was required.

V.) Laboratory Check Samples (LCS):

All LCS Recovery criteria were met, so no action was necessary.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

MS / MSD analyses were not performed in this fraction of the SDG. No action was required.

VII.) Field Duplicates:

There were no calculable Relative Percent Differences for the field duplicate samples in this fraction of the SDG. No action was required.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

TOTAL RECOVERABLE PETROLEUM HYDROCARBONS - GASOLINE RANGE (TRPH-GRO)

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was required.

III.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was necessary.

Field Blanks:

There were no positive detections in the field blanks, which were analyzed in SDG 28773A. No action was necessary.

IV.) Surrogates:

All Surrogate Recovery criteria were met. No action was required.

V.) Laboratory Check Samples (LCS):

All LCS Recovery criteria were met. No action was necessary.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

MS / MSD analyses were not performed in this fraction of the SDG. No action was required.

VII.) Field Duplicates:

There were no calculable Relative Percent Differences for the field duplicate samples in this fraction of the SDG. No action was required.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

TOTAL METALS AND CYANIDE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was necessary.

III.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Max. Conc.</u>	<u>Action Level</u>
CCB2	arsenic	2.10 ug/L	10.5 ug/L
PBW	barium	0.36 ug/L	1.80 ug/L
039EW008A2	chromium	1.20 ug/L	6.00 ug/L
039EW008A2	nickel	1.00 ug/L	5.00 ug/L
CCB2	selenium	3.40 ug/L	17.0 ug/L
PBW	silver	1.65 ug/L	8.25 ug/L
039DW008A2	sodium	82.5 ug/L	412 ug/L

CCB = Continuing Calibration Blank, PBW = Preparation Blank (Water),
039DW008A2 = Deionized Water Blank, 039EW027A2 = Equipment Rinsate Blank

The deionized water and equipment rinsate blanks were analyzed in SDG 28773A. All results greater than the IDL but less than 5X the blank amounts (Action Level, ug/L for water samples) for which the contaminated blank was an associated calibration, preparation or field blank were flagged as undetected (U).

The following analyte had a negative result with an absolute value greater than the IDL:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Neg. Conc.</u>	<u>5X Conc.</u>
CCB2	antimony	-3.50 ug/L	17.5 ug/L

CCB = Continuing Calibration Blank

All associated positive sample results less than 5X the absolute value of the negative blank results and all associated non-detects were flagged as estimated (J) and (UJ).

IV.) ICP Interference Check Sample Results:

All Percent Recovery criteria were met, so no action was taken.

The following analytes were detected in ICS Solution A at concentrations greater than the IDL:

antimony	3 ug/L
cadmium	1 ug/L
chromium	3 ug/L
cobalt	1 ug/L
copper	2 ug/L
lead	2 ug/L
selenium	5 ug/L
silver	8 ug/L
thallium	8 ug/L

These analytes should not be present. Since neither aluminum, calcium, iron nor magnesium was present in the samples at a concentration comparable to or greater than the amount in Solution A, no action was required.

Negative results were observed in ICS Solution A at absolute concentrations greater than the IDL for the following analytes:

arsenic	-3 ug/L
barium	-1 ug/L
potassium	-199 ug/L

Since neither aluminum, calcium, iron nor magnesium was present in the samples at a concentration comparable to or greater than the amount in Solution A, no action was required.

V.) ICP Serial Dilution Analysis:

All Serial Dilution Analysis criteria were met. No action was required.

VI.) Laboratory Control Samples (LCS):

All LCS criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this fraction of the SDG. No action was required.

VIII.) Matrix Spike Recoveries:

Matrix Spike analysis was not performed in this fraction of the SDG. No action was necessary.

IX.) Field Duplicates:

One set of field duplicate samples, 039GW010A2 and 039HW010A2 (analyzed in SDG 28773A), was analyzed by the laboratory. The calculable Relative Percent Differences (RPD's) were:

Analyte	039GW010A2, ug/L	039HW010A2, ug/L	RPD
aluminum	778	778	0%
arsenic	63.7	62.9	1.3%
barium	24.1	24.9	3.3%
calcium	19300	20200	4.6%
iron	36300	37100	2.2%
magnesium	8290	8640	4.1%
manganese	95.5	98.9	3.5%
potassium	681	711	4.3%
sodium	5670	5840	3.0%

None of the Relative Percent Differences (RPD's) exceeded the 30% QC limit for water samples. No action was required.

X.) Graphite Furnace Atomic Absorption QC (GFAA):

Graphite Furnace analyses were not used for the samples in this SDG. No action was taken.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was required.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria were met, so no action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

CHLORIDES

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was necessary.

Field Blanks:

There were no positive detections in the field blanks, which were analyzed in SDG 28773A. No action was required.

IV.) Laboratory Check Samples (LCS):

All LCS Recovery criteria were met, so no action was necessary.

V.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

MS / MSD analyses were not performed in this fraction of the SDG. No action was required.

VI.) Field Duplicates:

The Relative Percent Difference (RPD) for chlorides in field duplicate samples 039GW010A2 and 039HW010A2 (analyzed in SDG 28773A) was 0%, which was less than the 30% QC limit for water samples. No action was required.

VII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

SULFATES

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was necessary.

Field Blanks:

There were no positive detections in the field blanks, which were analyzed in SDG 28773A. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Recovery criteria were met, so no action was necessary.

V.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

MS / MSD analyses were not performed in this fraction of the SDG. No action was required.

VI.) Field Duplicates:

The Relative Percent Difference (RPD) for sulfates in field duplicate samples 039GW010A2 and 039HW010A2 (analyzed in SDG 28773A) was 0%, which was less than the 30% QC limit for water samples. No action was required.

VII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

TOTAL DISSOLVED SOLIDS (TDS)

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was necessary.

Field Blanks:

There were no positive detections in the field blanks, which were analyzed in SDG 28773A. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Recovery criteria were met, so no action was necessary.

V.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

MS / MSD analyses were not performed in this fraction of the SDG. No action was required.

VI.) Field Duplicates:

The Relative Percent Difference (RPD) for TDS in field duplicate samples 039GW010A2 and 039HW010A2 (analyzed in SDG 28773A) was 8.7%, which was less than the 30% QC limit for water samples. No action was required.

VII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
SERVICE ORDER NUMBER: 0242
CONTRACTED LAB: Southwest Laboratory of Oklahoma, Inc.
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3-90
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994; USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994
SAMPLE MATRICES: Water and Soil
TYPES OF ANALYSES: Volatile Organics, Total Metals
SDG NUMBERS: 29820 (Level III)

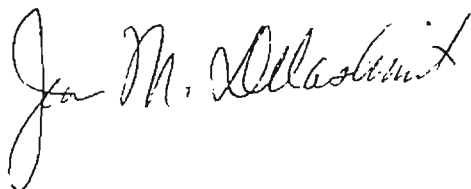
SAMPLES:

SDG 29820 (Level III):

Client Sample #	Lab Sample #	Matrix	Volatile Organics	Total Metals
042GP00401	29820.05	Water	X	
042GP00402	29820.06	Water	X	
042GP00501	29820.07	Water	X	
042GP00502	29820.08	Water	X	
506GP00101	29820.03	Water	X	
506GP00102	29820.02	Water	X	
506GP00201	29820.01	Water	X	
506GP00202	29820.04	Water	X	
506GP00301	29820.09	Water	X	
506GP00302	29820.11	Water	X	
506SP00164	29820.10	Soil		X

DATA REVIEWER(S): Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions

- J - The association numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Southwest Laboratory of Oklahoma, Inc. - 29820 Level III, CLP Volatile Organics and Total Metals

SAMPLES: 042GP00401, 042GP00402, 042GP00501, 042GP00502, 506GP00101, 506GP00102,
506GP00201, 506GP00202, 506GP00301, 506GP00302, 506SP00164

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met. No action was taken.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met. No action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviation (%RSD) was 33.1% for acetone in the standards analyzed on 6/12/97 on instrument N, which exceeded the 30% QC limit. The positive results for acetone in associated samples 506GP00102 and 506GP00202 were flagged as estimated (J).

Continuing Calibration:

The Percent Difference (%D) was 32.2% for acetone in the standard analyzed on 6/26/97 at 09:16 on instrument N, which exceeded the 25% QC limit. The non-detect results for acetone in the associated samples were flagged as estimated (UJ). The associated samples included all SDG samples except 506GP00102 and 506GL00202.

IV.) Blanks:

There were no positive detections in method blank VBLK1. No action was necessary.

Tentatively Identified Compounds (TIC's):

TIC's were not detected in the method blank. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD samples were not analyzed in this SDG. No action was necessary.

VII.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was taken.

VIII.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met. No action was required.

IX.) TCL Compound Identification:

All TCL Compound Identification criteria were met. No action was taken.

X.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met. No action was necessary.

XI.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met. No action was required.

XII.) System Performance:

All System Performance criteria were met. No action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

TOTAL METALS

I.) Holding Times:

All Holding Time criteria were met. No action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was necessary.

III.) Blanks:

The following blank results represent the highest detections associated with the sample and were used for data qualification:

Blank Type/ID#	Analyte	Max Conc.	Action Level
PBSI	aluminum	3.58 mg/kg	17.9 mg/kg
PBSI	calcium	9.48 mg/kg	49.0 mg/kg
PBSI	cobalt	0.07 mg/kg	0.35 mg/kg
PBSI	lead	0.24 mg/kg	1.20 mg/kg
PBSI	tin	1.39 mg/kg	6.95 mg/kg

PBS = Preparation Blank (Soil)

All results greater than the IDL but less than 5X the blank amount (Action Level, mg/kg for soil samples) for which the contaminated blank was an associated preparation blank were flagged as undetected (U).

The following analytes had negative results with absolute values greater than the IDL:

Blank Type/ID#	Analyte	Neg. Conc.	5X Conc.
CCB1	iron	-18.1 ug/L	18.1 mg/kg
CCB1	selenium	-3.20 ug/L	3.20 mg/kg
CCB2	silver	-1.90 ug/L	1.90 mg/kg

CCB = Continuing Calibration Blank

All associated positive sample results less than 5X the absolute value of the negative blank results and all associated non-detects were flagged as estimated (J) and (UJ).

IV.) ICP Interference Check Sample Results:

All Percent Recovery criteria were met, so no action was taken.

The following analytes were detected in ICS Solution A at concentrations greater than the IDL:

antimony	5 ug/L
barium	3 ug/L
cadmium	1 ug/L
cobalt	1 ug/L
manganese	1 ug/L
thallium	5 ug/L
vanadium	3 ug/L

These analytes should not be present. Calcium was detected in sample 506SP00164 at a concentration greater than that of ICS Solution A. The positive detections of the above listed analytes in this sample were flagged as estimated (J).

Negative results were observed in ICS Solution A at absolute concentrations greater than the IDL for the following analytes:

chromium	-1 ug/L
copper	-8 ug/L
lead	-3 ug/L
nickel	-5 ug/L
potassium	-208 ug/L

Calcium was detected in sample 506SP00164 at a concentration greater than that of ICS Solution A. The non-detect result for lead in this sample was flagged as estimated (UJ). Since the four other analytes had positive detections in the associated sample, no further action was taken.

V.) ICP Serial Dilution Analysis:

The Serial Dilution Percent Differences (%D's) were 24.3% and 14.3%, respectively, for potassium and sodium in serial dilution sample 506SP00164L, which exceeded the 10% QC limit. The detections of these two analytes in sample 506SP00164 were flagged as estimated (J).

VI.) Laboratory Control Samples (LCS):

All LCS Recovery criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VIII.) Matrix Spike Recoveries (MS):

No MS sample was analyzed in this SDG. No action was taken.

IX.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was required.

X.) Graphite Furnace Atomic Absorption QC (GFAA):

Graphite Furnace analyses were not used for the samples in this SDG. No action was required.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met, so no action was necessary.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria were met, so no action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe / Allen & Hoshall
SITE NAME: Charleston Naval Base, Zone A
SERVICE ORDER NUMBER: 0245
CONTRACTED LAB: Southwest Laboratories, Inc.
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3-90 or SW-846
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994
SAMPLE MATRIX: Water
TYPES OF ANALYSES: Total Volatiles, Total Semivolatiles
SDG NUMBER: 29956

Client Sample #	Lab Sample #	Matrix	Volatile Organics	Semi- volatiles
039GW00605	29956.01	Water	X	X
039GW00705	30011.01	Water	X	X
039GW00805	29993.01	Water	X	X
039GW00905	30011.02	Water	X	X
039GW01005	30036.01	Water	X	X
039HW01005	30036.02	Water	X	X
039GW01205	30052.01	Water	X	X
039GW08D05	29993.02	Water	X	X
039GW08D05RE	29993.02RE	Water		+
039GW09D05	30011.04	Water	X	X
039GW09I05	30011.03	Water	X	X
039GW10D05	30036.04	Water	X	X
039GW10I05	30036.03	Water	X	X
039GW12D05	30052.03	Water	X	X
039GW12I05	30052.02	Water	X	X
039GW12I05DL	30052.02DL	Water	+	
039DW00605	29956.02	Water	X	X
039EW00605	29956.03	Water	X	X
039FW00605	29956.04	Water	X	X
039TW00605	29956.05	Water	X	
039TW01005	30036.05	Water	X	
039TW08D05	29993.03	Water	X	
039TW09D05	30011.05	Water	X	

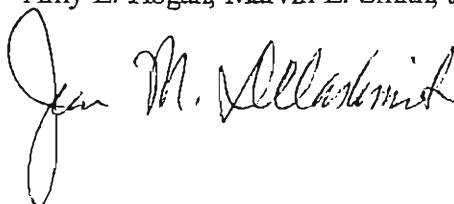
Client	Lab		Volatile	Semi-
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Organics</u>	<u>volatiles</u>
039TW12D05	30052.04	Water	X	
039GW00705MS	30011.01MS	Water	+	
039GW00705MSD	30011.01MSD	Water	+	
039GW01005MS	30036.01MS	Water	+	
039GW01005MSD	30036.01MSD	Water	+	

+ = Non-billable sample

DL = DILUTION, D = DEIONIZED WATER BLANK, E = EQUIPMENT RINSATE BLANK,
 F = FIELD BLANK, H = FIELD DUPLICATE, MS = MATRIX SPIKE,
 MSD = MATRIX SPIKE DUPLICATE, RE = REANALYSIS, T = TRIP BLANK

DATA REVIEWER(S): Amy L. Hogan, Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Southwest Laboratories of Oklahoma, Inc. - 29956 CLP Organics

SAMPLES: 039GW00605, 039GW00705, 039GW00805, 039GW00905, 039GW01005, 039HW01005, 039GW01205, 039GW08D05, 039GW08D05RE, 039GW09D05, 039GW09I05, 039GW10D05, 039GW10I05, 039GW12D05, 039GW12I05, 039GW12I05DL, 039DW00605, 039EW00605, 039FW00605, 039TW00605, 039TW01005, 039TW08D05, 039TW09D05, 039TW12D05, 039GW00705MS, 039GW00705MSD, 039GW01005MS, 039GW01005MSD

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met. No action was taken.

II.) GC/MS Tuning:

All GC/MS Tuning criteria were met. No action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviation (%RSD) exceeded the 30% QC limit for the standards analyzed on 6/12/97 on instrument N for acetone (33.1%). The positive result for this compound in associated sample 039GW00605 was flagged as estimated (J).

Continuing Calibration:

The Relative Response Factor (RRF) for 2-chloroethyl vinyl ether was 0.019, which was below the 0.050 QC limit, for the standards analyzed on 7/9/97 at 09:25 on instrument N. The results for this compound in the associated samples, which consisted entirely of non-detects, were rejected (R). The associated samples were 039GW00605 and blanks 039DW00605, 039EW00605, 039FW00605 and 039TW00605.

The Percent Difference (%D) exceeded the 25% QC limit for the standards analyzed on 7/9/97 at 09:25 on instrument N for 2-chloroethyl vinyl ether (86.7%). All results for this compound in the associated samples were previously rejected, so no further action was required.

The Percent Differences (%D's) exceeded the 25% QC limit for the standards analyzed on 7/10/97 at 12:46 on instrument N for the following compounds:

vinyl acetate	26.0%
4-methyl-2-pentanone	30.0%
2-hexanone	28.1%
1,1,2,2-tetrachloroethane	27.5%
2-chloroethyl vinyl ether	32.2%

The results for these compounds in associated samples 039GW00805 and 039GW08D05, which consisted entirely of non-detects, were flagged as estimated (UJ).

The Percent Difference (%D) for acetone (42.1%) exceeded the 25% QC limit for the standards analyzed on 7/14/97 at 11:46 on instrument N. The results for this compound in the associated samples, which consisted entirely of non-detects, were flagged as estimated (UJ). The associated samples were 039HW01005, 039GW10I05, 039GW10D05, 039GW01205, 039GW12I05 and 039GW12D05.

IV.) Blanks:

Method Blanks:

Chloroform was detected in all of the method blanks associated with this SDG at the following levels:

<u>Method Blank</u>	<u>Concentration</u>
VBLK1	1 ug/L
VBLK2	1 ug/L
VBLK3	2 ug/L
VBLK4	2 ug/L
VBLK5	3 ug/L

There were no positive results for this compound in the associated samples, so no action was taken.

Field Blanks:

Chloroform and bromodichloromethane were detected at 6 ug/L and 2 ug/L, respectively, in deionized water blank 037DW00605. There were no positive results for these compounds in the associated samples. No action was required.

Chloroform and bromodichloromethane were detected at 7 ug/L and 2 ug/L, respectively, in equipment rinsate blank 037EW00605. There were no positive results for these compounds in the associated samples. No action was required.

Chloroform and bromodichloromethane were detected at 7 ug/L and 2 ug/L, respectively, in field blank 037FW00605. There were no positive results for these compounds in the associated samples. No action was required.

Trip Blanks:

There were no positive detections in the trip blanks in this SDG. No action was required.

Tentatively Identified Compounds (TIC's):

There were no TIC's detected in the method, field or trip blanks. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

All MS / MSD criteria were met. No action was required.

VII.) Laboratory Control Samples (LCS):

Five LCS's were analyzed for this SDG. All LCS recovery criteria were met. No action was taken.

VIII.) Field Duplicates:

There were no calculable Relative Percent Differences (RPD's) for the field duplicate samples in this SDG, so no action was required.

IX.) Internal Standards Performance (ISTD):

All ISTD criteria were met. No action was required.

X.) TCL Compound Identification:

All Compound Identification criteria were met. No action was required.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

The result for 1,2-dichloroethene in sample 039GW12I05 exceeded the linear calibration range. The sample was diluted and reanalyzed. The dilution analysis result for this compound was transferred to the original data set on the spreadsheet by the validator.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met. No action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

The non-detect results for 2-chloroethyl vinyl ether in sample 039GW00605 and blanks 039DW00605, 039EW00605, 039FW00605 and 039TW00605 were rejected because of a low Relative Response Factor in the continuing calibration. All other laboratory data were acceptable with qualifications.

SEMIVOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) GC/MS Tuning:

All GC/MS Tuning criteria were met. No action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviations (%RSD's) exceeded the 30% QC limit for the standards analyzed on 7/21/97 on instrument T for benzo(k)fluoranthene (31.2%) and indeno(1,2,3-cd)pyrene (44.3%). Since there were no positive results for these compounds in the associated samples, no action was required.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the standards analyzed on 7/18/97 at 14:32 on instrument T for the following compounds:

hexachlorocyclopentadiene	42.9%
2,4-dinitrophenol	35.9%
4,6-dinitro-2-methylphenol	26.5%
indeno(1,2,3-cd)pyrene	43.8%
dibenz(a,h)anthracene	30.5%
benzo(g,h,i)perylene	55.8%

The results for these compounds in the associated samples, which consisted entirely of non-detects, were flagged as estimated (UJ). The associated samples were 039GW00705, 039GW00905, 039GW09I05 and 039GW09D05.

IV.) Blanks:

Method Blanks:

Bis(2-ethylhexyl)phthalate and di-n-butylphthalate were detected at 2 ug/L and 1 ug/L, respectively, in method blank SBLK1. The results for these compounds in associated sample 039GW00605, which were less than 10X the blank amounts, were flagged as undetected (U) with the analytical results less than the CRQL being raised to the CRQL.

Phenol and bis(2-ethylhexyl)phthalate were detected at 3 ug/L and 2 ug/L, respectively, in method blank SBLK2. The results for these compounds in associated sample 039GW00805 less than 10X the blank amounts were flagged as undetected (U) with the analytical results less than the CRQL being raised to the CRQL.

Bis(2-ethylhexyl)phthalate was detected at 3 ug/L in method blank SBLK3. The results for this compound in associated sample 039GW00705, 039GW00905, 039GW09D05 and 039GW09I05, which were less than 10X the blank amount, were flagged as undetected (U) with the analytical results less than the CRQL being raised to the CRQL.

Bis(2-ethylhexyl)phthalate and diethylphthalate were detected at 1 ug/L each in method blank SBLK4. The results for these compounds in the associated samples, which were less than 10X the blank amounts, were flagged as undetected (U) with the analytical results less than the CRQL being raised to the CRQL. The associated samples 039GW01005, 039HW01005, 039GW10I05, 039GW10D05, 039GW01205, 039GW12I05 and 039GW12D05.

Field Blanks:

Benzoic acid was detected at 2 ug/L in field blank 039FW00605. All positive results for this compound in the associated samples less than 5X the blank amount were flagged as undetected (U) with the analytical results less than the CRQL being raised to the CRQL. The associated samples were 039GW00805, 039GW00905, 039GW01005, 039GW01205, 039GW10I05, 039GW12D05 and 039GW12I05.

Bis(2-ethylhexyl)phthalate and benzoic acid were detected at 2 ug/L and 1 ug/L, respectively, in deionized water blank 039EW00605. Since all detections of these compounds in the associated samples were previously flagged, no further action was required.

Benzoic acid was detected at 2 ug/L in deionized water blank 039DW00605. Since all positive results for this compound in the associated samples were previously flagged, so no further action was required.

Tentatively Identified Compounds (TIC's):

There were no TIC's detected in the method or field blanks. No action was required.

V.) Surrogate Recoveries:

The Percent Recovery (%R) of 2-fluorophenol was 19% for sample 039GW00905, which was below the 21-100% QC limits. Since only one surrogate was below the limits, no action was required.

The Percent Recovery (%R) of 2-fluorophenol was 14% for sample 039GW010I05, which was below the 21-100% QC limits. Since only one surrogate was below the limits, no action was required.

The Percent Recoveries (%R's) were below their respective QC limits for sample 039GW08D05 for the following acid surrogate compounds:

<u>Surrogate</u>	<u>%R</u>	<u>QC Limits</u>
phenol-d5	4	10-94%
2-fluorophenol	5	21-100%
2,4,6-tribromophenol	7	10-123%

All acid compound results, which consisted entirely of non-detects, were rejected (R) since the %R's were less than 10%. The reanalysis of this sample did not yield improved recoveries.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

There were no MS / MSD analyses performed in this fraction of the SDG. No action was required.

VII.) Laboratory Control Samples (LCS):

Five LCS's were analyzed for this SDG. All LCS recovery criteria were met. No action was taken.

VIII.) Field Duplicates:

One set of field duplicate samples was analyzed by the laboratory for this SDG. The only calculable Relative Percent Difference (RPD) was:

<u>Compound</u>	<u>039HW01005</u>	<u>039GW01005</u>	<u>RPD</u>
naphthalene	4 ug/L	5 ug/L	22%

Since the RPD was within the 30% QC limit for water samples, no action was required.

IX.) Internal Standards Performance (ISTD):

All ISTD criteria were met. No action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met. No action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met. No action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met. No action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

The original analysis of sample 039GW08D05 was considered by the validator to be of preferable data quality to the reanalysis based on its better holding time and surrogate recovery.

The sixteen non-detect results for the acid compounds in sample 039GW08D05 were rejected based on extremely low surrogate recoveries. All other laboratory data were acceptable with qualifications.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

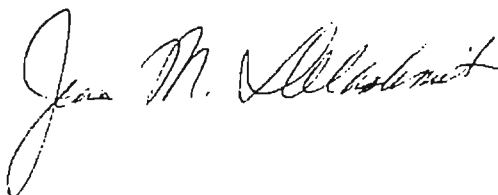
COMPANY: Ensafe / Allen & Hoshall
SITE NAME: Charleston Naval Base, Zone A
SERVICE ORDER NUMBER: 0248
CONTRACTED LAB: Southwest Laboratories, Inc.
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3-90 or SW-846
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994
SAMPLE MATRIX: Water
TYPES OF ANALYSES: Total Volatiles, Total Semivolatiles
SDG NUMBER: 30090

Client	Lab		Volatile	Semi-
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Organics</u>	<u>volatiles</u>
039GW01305	30090.01	Water	X	X
039GW01405	30118.01	Water	X	X
039GW01405RE	30118.01RE	Water		+
039GW01505	30118.03	Water	X	X
039GW01505RE	30118.03RE	Water		+
039HW01505	30118.04	Water	X	X
039HW01505RE	30118.04RE	Water		+
039GW13D05	30090.03	Water	X	X
039GW13I05	30090.02	Water	X	X
039GW14D05	30118.02	Water	X	X
039GW14D05RE	30118.02RE	Water		+
039GW15D05	30118.05	Water	X	X
039GW15D05RE	30118.05RE	Water		+
043GW00105	30146.01	Water	X	X
039DW13D05	30090.04	Water	X	X
039EW13D05	30090.05	Water	X	X
039FW13D05	30090.06	Water	X	X
039TW01505	30118.06	Water	X	
039TW13D05	30090.07	Water	X	
043TW00105	30146.02	Water	X	
039GW01405MS	30118.01MS	Water	+	
039GW01405MSD	30118.01MSD	Water	+	

D = DEIONIZED RINSATE BLANK, E = EQUIPMENT RINSATE BLANK, F = FIELD BLANK,
H = FIELD DUPLICATE, MS = MATRIX SPIKE, MSD = MATRIX SPIKE DUPLICATE,
RE = REANALYSIS, T = TRIP BLANK

DATA REVIEWER(S): Amy L. Hogan, Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:

A handwritten signature in black ink, appearing to read "Jean M. Delashmit". The signature is written in a cursive style with a large, looping initial "J".

Data Qualifier Definitions

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Southwest Laboratories of Oklahoma, Inc. - 30090 CLP Organics

SAMPLES: 039GW01305, 039GW01405, 039GW01405RE, 039GW01505, 039GW01505RE, 039HW01505, 039HW01505RE, 039GW13D05, 039GW13I05, 039GW14D05, 039GW14D05RE, 039GW15D05, 039GW15D05RE, 043GW00105, 039DW13D05, 039EW13D05, 039FW13D05, 039TW01505, 039TW13D05, 043TW00105, 039GW01405MS, 039GW01405MSD

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviation (%RSD) exceeded the 30% QC limit for the standards analyzed on 6/12/97 on instrument N for acetone (33.1%). There were no positive results for this compound in the associated samples. No action was required.

Continuing Calibration:

All Continuing Calibration criteria were met. No action was required.

IV.) Blanks:

Method Blanks:

Chloroform was detected in both method blanks associated with this SDG at 2 ug/L. There were no positive results for this compound in the SDG samples. No action was taken.

Field Blanks:

Chloroform and bromodichloromethane were detected at 6 ug/L and 1 ug/L, respectively, in deionized water blank 037DW13D05. There were no positive results for these compounds in the associated samples. No action was required.

Chloroform and bromodichloromethane were detected at 7 ug/L and 2 ug/L, respectively, in equipment rinsate blank 037EW13D05. There were no positive results for these compounds in the associated samples. No action was required.

Chloroform and bromodichloromethane were detected at 5 ug/L and 1 ug/L, respectively, in field blank 037FW13D05. There were no positive results for these compounds in the associated samples. No action was required.

Trip Blanks:

There were no positive detections in the trip blanks in this SDG. No action was required.

Tentatively Identified Compounds (TIC's):

There were no TIC's detected in the method, field or trip blanks. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

All MS / MSD criteria were met. No action was required.

VII.) Laboratory Control Samples (LCS):

Two LCS's were analyzed for this SDG. All LCS recovery criteria were met. No action was taken.

VIII.) Field Duplicates:

There were no calculable Relative Percent Differences (RPD's) for the field duplicate samples identified in this SDG. No action was required.

IX.) Internal Standards Performance (ISTD):

All ISTD criteria were met. No action was required.

X.) TCL Compound Identification:

All Compound Identification criteria were met. No action was required.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met. No action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

SEMIVOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviation (%RSD) exceeded the 30% QC limit for the standards analyzed on 7/18/97 on instrument M for 4-chloroaniline (32.7%). Since there were no positive results for this compound in the associated samples, no action was required.

The Percent Relative Standard Deviation (%RSD) exceeded the 30% QC limit for the standards analyzed on 7/21/97 on instrument P for benzo(k)fluoranthene (35.7%). Since there were no positive results for this compound in the associated samples, no action was required.

Continuing Calibration:

The Percent Difference (%D) exceeded the 25% QC limit for the standards analyzed on 7/23/97 at 13:47 on instrument M for 4-chloroaniline (31.0%). The non-detect results for this compound in associated samples 039GW01305, 039GW13D05 and 039GW13I05 were flagged as estimated (UJ).

The Percent Difference (%D) exceeded the 25% QC limit for the standards analyzed on 7/23/97 at 10:48 on instrument P for benzo(k)fluoranthene (52.6%). The non-detect result for this compound in associated sample 043GW00105 was flagged as estimated (UJ).

IV.) Blanks:

Method Blanks:

Bis(2-ethylhexyl)phthalate, di-n-butylphthalate and diethylphthalate were detected at 3 ug/L, 2 ug/L and 1 ug/L, respectively, in method blank SBLK2. The results for these compounds in associated sample 043GW00105, which were less than 10X the blank amounts, were flagged as undetected (U) with the

analytical results less than the CRQL being raised to the CRQL.

Field Blanks:

Positive detections were observed in deionized water blank 039DW13D05 for the following compounds:

phenol	4 ug/L
benzoic acid	4 ug/L
di-n-butylphthalate	1 ug/L
bis(2-ethylhexyl)phthalate	1 ug/L

The results for di-n-butylphthalate and bis(2-ethylhexyl)phthalate all samples for this SDG, which were less than 10X the blank amount, were flagged as undetected (U) with the results less than the CRQL being raised to the CRQL. The results for the other compounds in the samples, which were less than 5X the blank amount, were flagged as undetected (U) with the results less than the CRQL being raised to the CRQL.

Positive detections were observed in equipment rinsate blank 039EW13D05 for the following compounds:

phenol	3 ug/L
benzoic acid	2 ug/L
bis(2-ethylhexyl)phthalate	5 ug/L

The results for bis(2-ethylhexyl)phthalate in all samples in this SDG, which were less than 10X the blank amount, were flagged as undetected (U) with the analytical results less than the CRQL being raised to the CRQL. The results for the other compounds in the samples, which were less than 5X the blank amount, were flagged as undetected (U) with the analytical results less than the CRQL being raised to the CRQL.

Positive detections were observed in field blank 039FW13D05 for the following compounds:

phenol	12 ug/L
2-chlorophenol	13 ug/L
1,4-dichlorobenzene	6 ug/L
n-nitroso-di-n-propylamine	4 ug/L
benzoic acid	2 ug/L
1,2,4-trichlorobenzene	6 ug/L
4-chloro-3-methylphenol	13 ug/L
2,4,6-trichlorophenol	1 ug/L
acenaphthene	6 ug/L
2,4-dinitrotoluene	3 ug/L
4-nitrophenol	9 ug/L
pentachlorophenol	13 ug/L
pyrene	6 ug/L

The results for these compounds in all samples in this SDG, which were less than 5X the blank amount, were flagged as undetected (U) with the results less than the CRQL being raised to the CRQL.

Tentatively Identified Compounds (TIC's):

There were no TIC's detected in the method or field blanks. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

There were no MS / MSD analyses performed in this fraction of the SDG. No action was required.

VII.) Laboratory Control Samples (LCS):

Three LCS's were analyzed by the laboratory for this SDG. Several Percent Recoveries (%R's) were outside the QC limits. Data validation action based on LCS criteria was not required. No action was taken.

VIII.) Field Duplicates:

There were no calculable Relative Percent Differences (RPD's) for the field duplicate samples in this SDG. No action was required.

IX.) Internal Standards Performance (ISTD):

All ISTD criteria were met. No action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

The original analyses of samples 039GW01405, 039GW01505, 039HW01505, 039GW14D05 and 039GW15D05 were considered by the validator to be of preferable data quality to the reanalyses based on better holding times. All laboratory data were acceptable with qualifications.

VALIDATA

Chemical Services, Inc.

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(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
SERVICE ORDER NUMBER: 0261
CONTRACTED LAB: Southwest Laboratory of Oklahoma, Inc.
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3-90
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994
SAMPLE MATRIX: Water
TYPES OF ANALYSES: Volatile Organics, Semivolatile Organics
SDG NUMBER: 30486 (Level III)

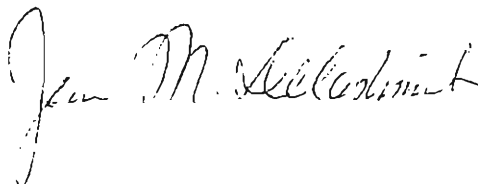
SAMPLES:

Client <u>Sample #</u>	Lab <u>Sample #</u>	<u>Matrix</u>	<u>Volatile Organics</u>	<u>Semi- volatiles</u>
039GW01105	30507.01	Water	X	X
039GW01105DL	30507.01DL	Water	+	+
039GW04I05	30486.01	Water	X	+
039GW04I05RE	40486.05RE	Water		X
039DW04I05	30486.03	Water	X	X
039EW04I05	30486.04	Water	X	+
039EW04I05RE	30486.04RE	Water		X
039FW04I05	30486.02	Water	X	X
039TW01105	30507.02	Water	X	
039TW04I05	30486.05	Water	X	

DL = DILUTION, DW = DEIONIZED WATER BLANK, EW = EQUIPMENT RINSATE BLANK,
FW = FIELD BLANK, RE = REANALYSIS, TW = TRIP BLANK

DATA REVIEWER(S): Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions

- J - The association numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Southwest Laboratory of Oklahoma, Inc. - 30486, CLP Organics

SAMPLES: 039GW01105, 039GW01105DL, 039GW04I05, 039GW04I05RE, 039DW04I05,
039EW04I05, 039EW04I05RE, 039FW04I05, 039TW01105, 039TW04I05

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met. No action was taken.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met. No action was required.

III.) Calibration:

Initial Calibration:

The average Relative Response Factor (RRF) was 0.030 for 2-chloroethyl vinyl ether in the standards analyzed on 8/4/97 on instrument I, which was below the 0.050 QC limit. The results for this compound in all SDG samples, field blanks and trip blanks, which consisted entirely of non-detects, were rejected (R).

The Percent Relative Standard Deviation (%RSD's) exceeded the 30% QC limit for the standards analyzed on 8/4/97 on instrument I for the following compounds:

acetone	65.6%
2-butanone	60.4%
1,1,2,2-tetrachloroethane	46.0%
2-chloroethyl vinyl ether	38.1%

The non-detect results for 2-chloroethyl vinyl ether were previously rejected because of a low RRF in this calibration. There were no detections of the other three compounds in the associated samples after blank qualifications. No further action was taken.

Continuing Calibration:

The Relative Response Factor (RRF) was 0.031 for 2-chloroethyl vinyl ether in the standard analyzed on 8/7/97 at 09:40 on instrument I, which was below the 0.050 QC limit. The non-detect results for this compound in the associated sample, field and trip blanks were previously rejected because of a low RRF in the initial calibration. No further action was taken.

The Relative Response Factor (RRF) was 0.022 for 2-chloroethyl vinyl ether in the standard analyzed on 8/11/97 at 09:17 on instrument I, which was below the 0.050 QC limit. The non-detect results for this compound in the associated sample and trip blank were previously rejected because of a low RRF in the initial calibration. No further action was taken.

The Percent Differences (%D's) exceeded the 25% QC limit in the standard analyzed on 8/11/97 at 09:17 on instrument I for the following compounds:

acetone	40.5%
2-butanone	35.7%
4-methyl-2-pentanone	26.4%
2-hexanone	37.6%
1,1,2,2-tetrachloroethane	34.0%
2-chloroethyl vinyl ether	26.7%

The non-detect results for 2-chloroethyl vinyl ether in the associated sample and trip blank were previously rejected because of a low RRF in the initial calibration. All results for the other five compounds in associated sample 039GW01105, which consisted entirely of non-detects after blank qualifications, were flagged as estimated (UJ).

IV.) Blanks:

Method Blanks:

Methylene chloride was detected at 2 ug/L in method blank VBLK2. Since the field blanks were used for blank qualifications, no action was required.

Field Blanks:

Acetone and methylene chloride were detected at 3 ug/L and 5 ug/L, respectively, in equipment rinsate blank 039EW04I05. The detections of these two compounds in associated samples 039GW01105 and 039GW04I05, which were less than 10X the blank amounts, were flagged as undetected (U) with analytical results below the CRQL being raised to the CRQL. Chloroform (6 ug/L) and bromodichloromethane (2 ug/L) were also detected in this blank. Since these two compounds were not detected in the associated samples, no further action was necessary.

Acetone (2 ug/L), methylene chloride (6 ug/L), chloroform (7 ug/L) and bromodichloromethane (2 ug/L) were detected in deionized water blank 039DW04I05. Since the equipment rinsate blank was used for blank qualifications, no action was taken.

Acetone (3 ug/L), methylene chloride (2 ug/L), chloroform (7 ug/L) and bromodichloromethane (2 ug/L) were detected in field blank 039FW04I05. Since the equipment rinsate blank was used for blank qualifications, no action was taken.

Trip Blanks:

The following compounds were detected in trip blank 039TW01105:

methylene chloride	6 ug/L
chloroform	130 ug/L
bromodichloromethane	26 ug/L
dibromochloromethane	6 ug/L
benzene	2 ug/L
total xylene	4 ug/L

The detections of benzene and total xylene exceeded 5X the blank amounts. No action was taken. Acetone was previously qualified using the equipment rinsate blank. The other three compounds were not detected in the associated samples. No further action was necessary.

Methylene chloride was detected at 2 ug/L in trip blank 039TW04105. Since this compound was qualified using the equipment rinsate blank, no further action was taken.

Tentatively Identified Compounds (TIC's):

TIC's were not detected in any SDG sample. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD samples were not analyzed in this SDG. No action was necessary.

VII.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was taken.

VIII.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met. No action was required.

IX.) TCL Compound Identification:

All TCL Compound Identification criteria were met. No action was taken.

X.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

The concentration of total xylene in sample 039GW01105 exceeded the standard calibration range. The concentration of this compound in the original analysis was replaced by the validator with the diluted sample (039GW01105DL) result with the appropriate qualifier (D).

XI.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met. No action was required.

XII.) System Performance:

All System Performance criteria were met. No action was taken.

XIII.) Overall Assessment of Data/General:

The non-detect results for 2-chloroethyl vinyl ether were rejected in all SDG samples, field blanks and trip blanks because of low RRF's in the initial and continuing calibrations. All other laboratory data were acceptable with qualifications.

SEMIVOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met. No action was necessary.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was taken.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviations (%RSD's) were 40.7% and 32.4%, respectively, for hexachlorocyclopentadiene and benzo(k)fluoranthene in the standards analyzed on 8/12/97 on instrument P, which exceeded the 30% QC limit. There were no detections of the two compounds in the associated samples. No action was required.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 4/21/97 at 10:10 on instrument P for the following compounds:

hexachlorocyclopentadiene	37.7%
benzo(k)fluoroanthene	41.2%

The non-detect results for these two compounds in associated samples 039GW01105 and 039GW04I05RE were flagged as estimated (UJ).

IV.) Blanks:

Method Blanks:

Phenol was detected at 1 ug/L and 2 ug/L, respectively, in method blanks SBLK2 and SBLK3. This compound was not detected in the associated samples. No action was necessary.

Field Blanks:

Bis(2-ethylhexyl)phthalate was detected at 2 ug/L, 2 ug/L and 4 ug/L, respectively, in deionized water blank 039DW04I05, equipment rinsate blank 039EW04I05RE and field blank 039FW04I05. The detections of this compound in associated samples 039GW001105 and 039GW04I05RE, which was less than 10X the blank amount, were flagged as undetected (U) with the analytical result below the CRQL being raised to the CRQL. Phenol was detected at 8 ug/L in the deionized water blank. Since this compound was not detected in the associated samples, no further action was required.

Tentatively Identified Compounds (TIC):

Trimethyldodecatrien-ol was detected in the deionized water blank at a concentration sufficient, using the 5X Rule, to eliminate the detection in sample 039GW04I05RE. Data validation action based on TIC criteria was not required. No action was taken.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met in the reanalysis samples. No action was required.

VI.) Laboratory Control Samples (LCS):

Four LCS's were analyzed by the laboratory. One LCS Recovery was below the QC limits. Data validation action based on LCS Recovery criteria was not required. No action was necessary.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD samples were not analyzed in this SDG. No action was taken.

VIII.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was required.

IX.) Internal Standards Performance:

All Internal Standards Performance criteria were met, so no action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was required.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

The concentrations of naphthalene and 2-methylnaphthalene in sample 039GW01105 exceeded the standard calibration range. The concentrations of the two compounds in the original analyses were replaced by the validator with the diluted sample (039GW01105DL) results with the appropriate qualifier.

XII.) Tentatively Identified Compounds (TIC's):

All TIC criteria were met, so no action was necessary.

XIII.) System Performance:

All System Performance criteria were met, so no action was taken.

XIV) Overall Assessment of Data/General:

The reanalyses of samples 039GW01105 and 039GW04105 were considered by the validator to be of preferable data quality because of improved surrogate recoveries. All laboratory data were acceptable with qualifications.

VALIDATA

Chemical Services, Inc.

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DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
SERVICE ORDER NUMBER: 0272
CONTRACTED LAB: Southwest Laboratory of Oklahoma, Inc.
QA/QC LEVEL: EPA Level III
EPA METHODS: EPA SOW 3-90 / SW846
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994; USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994
SAMPLE MATRIX: Water
TYPES OF ANALYSES: Volatile Organics, Semivolatile Organics, Total Metals
SDG NUMBER: 31302 (Level III)

SAMPLES:

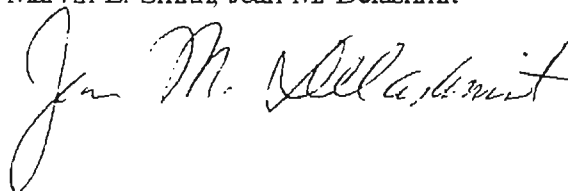
Client	Lab		Volatile	Semi-	Total
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Organics</u>	<u>volatiles</u>	<u>Metals</u>
039GW01206	31302-07	Water	X	X	X
039GW12D06	31302-05	Water	X	X	X
039GW12I06	31302-01	Water	X	X	X
039GW12I06DL	31302-01DL	Water	+		
039DW12I06	31302-02	Water	X	X	X
039EW12I06	31302-03	Water	X	+	X
039EW12I06RE	31302-03RE	Water		X	
039FW12I06	31302-04	Water	X	X	X
039TW12I06	31302-06	Water	X		

+ = Non-billable analysis

DW = DEIONIZED WATER BLANK, DL = DILUTION, EW = EQUIPMENT RINSATE BLANK,
FW = FIELD BLANK, RE = REANALYSIS, TW = TRIP BLANK

DATA REVIEWER(S): Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Southwest Laboratory of Oklahoma, Inc. - 31302 Level III, CLP Organics and Inorganics

SAMPLES: 039GW01206, 039GW12D06, 039GW12I06, 039GW12I06DL, 039DW12I06,
039EW12I06, 039EW12I06RE, 039FW12I06, 039TW12I06

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit in the standards analyzed on 10/6/97 at 08:38 on instrument N for the following compounds:

bromomethane	53.4%
chloroethane	32.9%
acetone	51.7%
2-butanone	46.9%
vinyl acetate	25.9%

All results for these compounds in associated samples 039GW01206, 039GW12D06 and 039GW12I06, which consisted entirely of non-detects after blank qualifications, were flagged as estimated (UJ).

IV.) Blanks:

Method Blank:

There were no positive detections in the method blank. No action was taken.

Deionized Water Blank:

Chloroform and bromodichloromethane were detected at 7 ug/L and 2 ug/L, respectively, in deionized

water blank 039DW12I06. There were no detections of chloroform or bromodichloromethane in the associated samples. No action was required.

Equipment Rinsate Blank:

Acetone, chloroform and bromodichloromethane were detected at 21 ug/L, 7 ug/L and 2 ug/L, respectively, in equipment rinsate blank 039EW12I06. There were no detections of chloroform or bromodichloromethane in the associated samples. No action was required. The detections of acetone in associated samples 039GW01206 and 039GW12D06, which were less than 10X the blank amount, were flagged as undetected (U) with analytical results below the CRQL being raised to the CRQL.

Field Blank:

Acetone, chloroform and bromodichloromethane were detected at 7 ug/L, 7 ug/L and 2 ug/L, respectively, in field blank 039FW12I06. There were no detections of chloroform or bromodichloromethane in the associated samples. No action was required. The detections of acetone in associated samples were qualified using the equipment rinsate blank. No further action was necessary.

Trip Blanks:

Acetone, chloroform and bromodichloromethane were detected at 19 ug/L, 7 ug/L and 2 ug/L, respectively, in trip blank 039TW12I06. There were no detections of chloroform or bromodichloromethane in the associated samples. No action was required. The detections of acetone in associated samples were qualified using the equipment rinsate blank. No further action was necessary.

Tentatively Identified Compounds (TIC):

Fluorotrimethyl silane was detected in the trip blank. Since this TIC was not detected in the associated samples, no action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was required.

VI.) Laboratory Control Samples (LCS):

Two LCS's were analyzed by the laboratory. Four LCS recoveries exceeded the QC limits. Data validation action based on LCS Recovery criteria was not required. No action was taken.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD samples were not analyzed in this SDG. No action was necessary.

VIII.) Field Duplicates:

Field duplicate sample were not analyzed in this SDG. No action was taken.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

The concentration of 1,2-dichloroethene in sample 039GW12I06 exceeded the standard calibration range. The result for this compound in the original analysis was replaced by the validator with the dilution analysis result (039GW12I06DL) and the corresponding flag (D).

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

SEMIVOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met. No action was necessary.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was taken.

III.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was necessary.

IV.) Blanks:

Method Blanks:

Bis(2-ethylhexyl)phthalate was detected at 13 ug/L and 6 ug/L, respectively, in method blanks SBLK1 and SBLK2. The detections of this compound in associated samples 039GW01206, 039GW12D06 and 039GW12I06, which were less than 10X the blank amounts, were flagged as undetected (U) with

analytical results below the CRQL being replaced with the CRQL.

Field Blanks:

Bis(2-ethylhexyl)phthalate was detected at 6 ug/L, 7 ug/L and 7 ug/L, respectively, in deionized water blank 039DW12I06, equipment rinsate blank 039EW12I06RE and field blank 039FW12I06. Since the method blanks were used for blank qualifications, no further action was necessary.

Tentatively Identified Compounds (TIC):

Ethyl octene and dimethyl-methyl cyclopentane were detected in the deionized water blank. Since these TIC's were not detected in the associated samples, no action was necessary.

V.) Surrogate Recoveries:

The Percent Recovery (%R) was 5% for 2-fluorophenol in equipment rinsate blank 039EW12I06, which was below the 21-100% QC limits. All Surrogate Recovery criteria were met in reanalysis of this blank (039EW12I06). Since the reanalysis sample was used for data qualification, no action was required.

VI.) Laboratory Control Samples (LCS):

Two LCS's were analyzed by the laboratory. All LCS Recovery criteria were met. No action was necessary.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD samples were not analyzed in this SDG. No action was taken.

VIII.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was required.

IX.) Internal Standards Performance:

All Internal Standards Performance criteria were met, so no action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was required.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was taken.

XII.) Tentatively Identified Compounds (TIC's):

All TIC criteria were met, so no action was necessary.

XIII.) System Performance:

All System Performance criteria were met, so no action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

TOTAL METALS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was necessary.

III.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Max. Conc.</u>	<u>Action Level</u>
ERB	aluminum	14.3 ug/L	71.5 ug/L
CCB1	cadmium	0.41 ug/L	2.05 ug/L
ERB	iron	31.5 ug/L	158 ug/L
ERB	lead	5.50 ug/L	27.5 ug/L
FB	manganese	2.60 ug/L	13.0 ug/L
ICB	potassium	73.7 ug/L	369 ug/L
DWB	sodium	6300 ug/L	31500 ug/L
ERB	zinc	16.0 ug/L	80.0 ug/L

CCB = Continuing Calibration Blank, DWB = Deionized Water Blank (039DW12I06),

ERB = Equipment Rinsate Blank (039EW12I06), FB = Field Blank (039FW12I06).

ICB = Initial Calibration Blank

All results greater than the IDL but less than 5X the blank amount (Action Level, ug/L for water samples) for which the contaminated blank was an associated calibration, deionized water, equipment rinsate or field blank were flagged as undetected (U).

The following analytes had negative results with absolute values greater than the IDL:

<u>Blank ID</u>	<u>Analyte</u>	<u>Neg. Conc.</u>	<u>5X Conc.</u>
CCB1	arsenic	-2.90 ug/L	14.5 ug/L
PBW	calcium	-53.8 ug/L	269 ug/L

CCB = Continuing Calibration Blank, PBW = Preparation Blank (Water)

All associated positive sample results less than 5X the absolute value of the negative blank results and all associated non-detects were flagged as estimated (J) and (UJ).

IV.) ICP Interference Check Sample Results:

All Percent Recovery criteria were met, so no action was taken.

The following analytes were present in ICS Solution A at concentrations greater than the IDL:

antimony	8 ug/L
barium	1 ug/L
beryllium	1 ug/L
copper	2 ug/L
lead	4 ug/L

These analytes should not be present. Additionally, negative results were observed in ICS Solution A at absolute concentrations greater than the IDL for the following analytes:

potassium	-634 ug/L
sodium	-63 ug/L
vanadium	-3 ug/L

Since calcium, iron, magnesium nor iron was detected in the samples at a concentration comparable to or greater than that of ICS Solution A, no action was taken.

V.) ICP Serial Dilution Analysis:

Serial Dilution Analysis was not performed in this SDG. No action was required.

VI.) Laboratory Control Samples (LCS):

All LCS Recovery criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in SDG. No action was taken.

VIII.) Matrix Spike Recoveries (MS):

MS samples were not analyzed in this SDG. No action was taken.

IX.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was required.

X.) Graphite Furnace Atomic Absorption QC (GFAA):

Graphite Furnace analyses were not used for the samples in this SDG. No action was required.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met, so no action was necessary.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria were met, so no action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

VALIDATA

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DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe / Allen & Hoshall
SITE NAME: Charleston Naval Base, Zone A
SERVICE ORDER NUMBER: 0273
CONTRACTED LAB: Southwest Laboratories of Oklahoma, Inc.
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3-90 or SW-846
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994; USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994

SAMPLE MATRIX: Water
TYPES OF ANALYSES: Volatile Organics, Semivolatile Organics, Total Metals

SDG NUMBER: 31345

Client	Lab		Volatile	Semi-	Total
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Organics</u>	<u>volatiles</u>	<u>Metals</u>
039GW00606	31345.02	Water	X	X	X
039GW00606RE	31345.02RE	Water		+	
039GW00706	31345.13	Water	X	X	X
039GW00706RE	31345.13RE	Water		+	
039GW00806	31345.03	Water	X	X	X
039GW00806RE	31345.03RE	Water		+	
039GW00906	31345.05	Water	X	X	X
039GW00906RE	31345.05RE	Water		+	
039GW01006	31345.08	Water	X	X	X
039GW01006RE	31345.08RE	Water		+	
039HW01006	31345.09	Water	X	X	X
039HW01006RE	31345.09RE	Water		+	
039GW01106	31345.14	Water	X	X	X
039GW01106DL	31345.14DL	Water		+	
039GW01306	31345.15	Water	X	X	X
039GW01306RE	31345.15RE	Water		+	
039GW01406	31345.18	Water	X	X	X
039GW01506	31345.20	Water	X	X	X
039HW01506	31345.21	Water	X	X	X
039GW04106	31345.01	Water	X	X	X
039GW04106RE	31345.01RE	Water		+	


Client <u>Sample #</u>	Lab <u>Sample #</u>	<u>Matrix</u>	<u>Volatile Organics</u>	<u>Semi- volatiles</u>	<u>Total Metals</u>
039GW08D06	31345.04	Water	X	X	X
039GW08D06RE	31345.04RE	Water		+	
039GW09D06	31345.07	Water	X	X	X
039GW09D06RE	31345.07RE	Water		+	
039GW09I06	31345.06	Water	X	X	X
039GW09I06RE	31345.06RE	Water		+	
039GW10D06	31345.11	Water	X	X	X
039GW10D06RE	31345.11RE	Water		+	
039GW10I06	31345.10	Water	X	X	X
039GW10I06RE	31345.10RE	Water		+	
039GW13D06	31345.17	Water	X	X	X
039GW13I06	31345.16	Water	X	X	X
039GW14D06	31345.19	Water	X	X	X
039GW15D06	31345.22	Water	X	X	X
043GW00I06	31345.23	Water	X	X	X
039TW01006	31345.12	Water	X		
039GW04I06MS	31345.01MS	Water	+		
039GW04I06MSD	31345.01MSD	Water	+		

+ = Non-billable analysis

MS = MATRIX SPIKE, MSD = MATRIX SPIKE DUPLICATE, RE = REANALYSIS,
T = TRIP BLANK

DATA REVIEWER(S): Amy L. Hogan, Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions

- J - The association numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Southwest Laboratories of Oklahoma, Inc. - 31345 CLP Organics & Inorganics

SAMPLES: 039GW00606, 039GW00606RE, 039GW00706, 039GW00706RE, 039GW00806, 039GW00806RE, 039GW00906, 039GW00906RE, 039GW01006, 039GW01006RE, 039HW01006, 039HW01006RE, 039GW01106, 039GW01106DL, 039GW01306, 039GW01306RE, 039GW01406, 039GW01506, 039HW01506, 039GW04I06, 039GW04I06RE, 039GW08D06, 039GW08D06RE, 039GW09D06, 039GW09D06RE, 039GW09I06, 039GW09I06RE, 039GW10D06, 039GW10D06RE, 039GW10I06, 039GW10I06RE, 039GW13D06, 039GW13I06, 039GW14D06, 039GW15D06, 043GW00106, 039TW01006, 039GW04I06MS, 039GW04I06MSD

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met. No action was taken.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met. No action was required.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met. No action was required.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the standards run on 10/11/97 at 10:22 on instrument N for the following compounds:

bromomethane	47.5%
chloroethane	26.7%
acetone	65.0%
2-butanone	45.5%
vinyl acetate	25.9%
2-hexanone	56.2%

The positive results for acetone in associated samples 039GW00606 and 039GW01106 were flagged as estimated (J). The results for the other five compounds in all samples in this SDG, which consisted entirely of non-detects, were flagged as estimated (UJ).

IV.) Blanks:

Method Blanks:

There were no positive detections in the associated method blanks. No action was required.

Trip Blanks:

Chloroform and bromodichloromethane were detected at 7 ug/L and 2 ug/L, respectively, in trip blank 039TW01006. There were no positive results for these compounds in the associated samples. No action was required.

Tentatively Identified Compounds (TIC's):

There were no TIC's detected in the method or trip blanks. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

All MS / MSD criteria were met. No action was required.

VII.) Laboratory Control Samples (LCS):

One LCS was analyzed for this SDG. Several Percent Recoveries were outside their respective QC limits. Data validation action based on LCS Recovery criteria was not required. No action was taken.

VIII.) Field Duplicates:

There were no calculable Relative Percent Differences (RPD's) for the field duplicate samples in this fraction of the SDG. No action was required.

IX.) Internal Standards Performance (ISTD):

All ISTD criteria were met. No action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

SEMIVOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met. No action was required.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met. No action was required.

Continuing Calibration:

The Percent Difference (%D) exceeded the 25% QC limit for the standard run on 10/21/97 at 14:27 on instrument T for 3,3'-dichlorobenzidine (27.6%). The results for this compound in associated samples 039GW10D06 and 039GW00706, which were both non-detects, were flagged as estimated (UJ).

IV.) Blanks:

Method Blanks:

Di-n-butylphthalate was detected at 4 ug/L in method blank SBLK1. All positive results for this compound in the associated samples, which were less than 10X the blank amount, were flagged as undetected (U) with results less than the CRQL being raised to the CRQL. The associated samples were 039GW04I06, 039GW00606, 039GW00806, 039GW08D06, 039GW00906, 039GW09I06, 039GW09D06, 039GW01006, 039HW01006, 039GW10I06, 039GW10D06 and 039GW00706. Based on the extremely low surrogate recovery of 2-fluorophenol of method blank SBLK1, the acid fraction of the blank was not used for blank qualification.

Di-n-butylphthalate was detected at 4 ug/L in method blank SBLK2. All positive results for this

compound in the associated samples, which were less than 10X the blank amount, were flagged as undetected (U) with results less than the CRQL being raised to the CRQL. The associated samples were 039GW01106, 039GW01306, 039GW13I06, 039GW13D06, 039GW01406, 039GW14D06, 039GW01506, 039HW01506, 039GW15D06, 043GW00106 and 039GW01106DL.

Tentatively Identified Compounds (TIC's):

There were no TIC's detected in the method blanks. No action was required.

V.) Surrogate Recoveries:

The Percent Recovery (%R) of 2-fluorophenol was 2% for method blank SBLK1, which was below the 21-100% QC limits. Since this sample was a method blank, and there were no detections of acid compounds in the associated samples, no action was required. The associated samples were 039GW01306, 039GW04I06, 039GW00606, 039GW00806, 039GW08D06, 039GW00906, 039GW09I06, 039GW09D06, 039GW01006, 039HW01006, 039GW10I06, 039GW10D06 and 039GW00706.

The Percent Recovery (%R) of 2-fluorophenol was 3% for sample 039GW01306, which was below the 21-100% QC limits. All results for the acid fraction of this sample, which consisted entirely of non-detects, were rejected (R) since the %R was less than 10%.

The Percent Recovery (%R) of 2-fluorobiphenyl was 42% for sample 039GW13I06, which was below the 43-116% QC limits. Since only one surrogate %R was below the QC limits, no action was required.

The Percent Recovery (%R) of 2-fluorobiphenyl was 42% for sample 043GW00106, which was below the 43-116% QC limits. Since only one surrogate %R was below the QC limits, no action was required.

The Percent Recoveries (%R's) of terphenyl-d14 and 2-fluorophenol in sample 039GW00806 were 32% and 9%, respectively, which were below their 33-141% and 21-100% QC limits. All acid compound results for this sample, which consisted entirely of non-detects, were rejected (R) since the %R was less than 10%. Since only one surrogate %R was below the QC limits in the base/neutral fraction, so further action was taken.

The Percent Recovery (%R) of 2-fluorophenol was 8% for sample 039GW09I06, which was below the 21-100% QC limits. All results for the acid fraction of this sample, which consisted entirely of non-detects, were rejected (R) since the %R was less than 10%.

The Percent Recovery (%R) of 2-fluorophenol was 3% for sample 039GW01006, which was below the 21-100% QC limits. All results for the acid fraction of this sample, which consisted entirely of non-detects, were rejected (R) since the %R was less than 10%.

The Percent Recoveries (%R's) of the following surrogates were outside their QC limits for sample 039GW08D06:

<u>Surrogate</u>	<u>%R</u>	<u>QC Limits</u>
phenol-d5	1%	10-94%
2-fluorophenol	0%	21-100%
2,4,6-tribromophenol	0%	10-123%

The acid compound results for this sample, which consisted entirely of non-detects, were rejected (R) since the %R's were less than 10%.

The Percent Recoveries (%R's) for the following surrogates were outside their QC limits for sample 039HW01006:

<u>Surrogate</u>	<u>%R</u>	<u>QC Limits</u>
nitrobenzene-d5	33%	35-114%
2-fluorobiphenyl	39%	43-116%

All positive and non-detect results for the base/neutral fraction of this sample were flagged as estimated (J) and (UJ).

The Percent Recoveries (%R's) for the following surrogates were outside their QC limits for sample 039GW10106:

<u>Surrogate</u>	<u>%R</u>	<u>QC Limits</u>
phenol-d5	2%	10-94%
2-fluorophenol	1%	21-100%
2,4,6-tribromophenol	2%	10-123%

The acid compound results for this sample, which consisted entirely of non-detects, were rejected (R) since the %R's were less than 10%.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD analyses were not performed in this fraction of the SDG. No action was required.

VII.) Laboratory Control Samples (LCS):

All LCS Recovery criteria were met. No action was taken.

VIII.) Field Duplicates:

Two sets of field duplicate samples were analyzed by the laboratory for this SDG. The calculable Relative Percent Differences (RPD's) were:

<u>Compound</u>	<u>039GW01006</u>	<u>039HW01006</u>	<u>RPD</u>
naphthalene	5.0 ug/L	4.0 ug/L	22%
<u>Compound</u>	<u>039GW01506</u>	<u>039HW01506</u>	<u>RPD</u>
benzoic acid	2.0 ug/L	1.0 ug/L	67%
bis(2-ethylhexyl)phthalate	6.0 ug/L	4.0 ug/L	40%

The results for the two compounds in samples 039GW01506 and 039HW01506 were flagged as estimated (J), since their RPD's exceeded the 30% QC limit for water samples. All RPD criteria were met for the other set of field duplicate samples. No further action was necessary.

IX.) Internal Standards Performance (ISTD):

All ISTD criteria were met. No action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

The concentrations of naphthalene and 2-methylnaphthalene in sample 039GW01106 exceeded the standard calibration range. The results for the two compounds in the original analysis were replaced by the validator with the dilution analysis results (039GW01106DL) and the corresponding flags (D).

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

The original analyses for samples 039GW00606, 039GW00706, 039GW00806, 039GW00906, 039GW01006, 039HW01006, 039GW01306, 039GW04106, 039GW08D06, 039GW09D06, 039GW09I06, 039GW10D06 and 039GW10I06 were considered by the validator to be of preferable data quality to the reanalyses based on holding times.

The acid compound fraction of samples 039GW00806, 039GW09I06, 039GW01006, 039GW10I06, 039GW01306 and 039GW08D06 were rejected (R) because of extremely low acid surrogate recoveries. All other laboratory data were acceptable with qualifications.

TOTAL METALS

I.) Holding Times:

All Holding Time criteria were met. No action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was necessary.

III.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Max. Conc.</u>	<u>Action Level</u>
PBW	aluminum	11.2 ug/L	56.0 ug/L
CCB5	antimony	2.10 ug/L	10.5 ug/L
PBW	copper	1.65 ug/L	8.30 ug/L
PBW	lead	1.84 ug/L	9.20 ug/L
PBW	manganese	0.77 ug/L	3.90 ug/L
ICB	potassium	149 ug/L	745 ug/L
PBW	sodium	45.1 ug/L	226 ug/L
PBW	zinc	10.6 ug/L	53.0 ug/L

CCB = Continuing Calibration Blank, ICB = Initial Calibration Blank

PBW = Preparation Blank (Water)

All results greater than the IDL but less than 5X the blank amounts (Action Level, ug/L for water samples) for which the contaminated blank was an associated calibration or preparation blank were flagged as undetected (U).

There were no analytes having negative results with absolute values greater than the IDL. No action was required.

IV.) ICP Interference Check Sample Results:

All Percent Recovery criteria were met, so no action was taken.

The following analytes were detected in ICS Solution A at concentrations greater than the IDL:

antimony	8 ug/L
arsenic	4 ug/L
barium	1 ug/L
beryllium	1 ug/L
cadmium	1 ug/L
chromium	1 ug/L
copper	3 ug/L
lead	4 ug/L
silver	1 ug/L

These analytes should not be present. Since neither aluminum, calcium, iron nor magnesium was present in the samples at a concentration comparable to or greater than the amount in Solution A, no action was required.

Negative results were observed in ICS Solution A at absolute concentrations greater than the IDL for the following analytes:

manganese	-2 ug/L
potassium	-660 ug/L
sodium	-51 ug/L
vanadium	-4 ug/L

Since neither aluminum, calcium, iron nor magnesium was present in the samples at a concentration comparable to or greater than the amount in Solution A, no action was required.

V.) ICP Serial Dilution Analysis:

The Percent Difference (%D) for arsenic in dilution sample 039GW04I06DL was 31%, which exceeded the 10% QC limit. All positive results for this analyte in the associated samples were flagged as estimated (J).

VI.) Laboratory Control Samples (LCS):

All LCS Recovery criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this fraction of the SDG. No action was required.

VIII.) Matrix Spike Recoveries:

Matrix Spike Analysis was not performed in this fraction of the SDG. No action was required.

IX.) Field Duplicates:

Two sets of field duplicate samples were analyzed by the laboratory in this SDG. The calculable Relative Percent Differences (RPD's) were:

<u>Compound</u>	<u>039GW01006, ug/L</u>	<u>039HW01006, ug/L</u>	<u>RPD</u>
aluminum	381	89.6	124%
arsenic	5.7	4.3	28%
barium	42.4	43	1.4%
calcium	22800	23300	2.2%
iron	3430	1340	8.8%
magnesium	7170	7300	1.8%
manganese	6	5.2	14.3%
potassium	943	893	5.4%
sodium	2990	2950	1.3%

<u>Compound</u>	<u>039GW01506, ug/L</u>	<u>039HW01506, ug/L</u>	<u>RPD</u>
arsenic	4.3	6.6	42%
barium	788	795	0.9%
calcium	90700	91300	0.7%
chromium	1.7	1.6	6.1%
iron	3700	3760	1.6%

<u>Compound</u>	<u>039GW01506, ug/L</u>	<u>039HW01506, ug/L</u>	<u>RPD</u>
magnesium	271000	272000	0.4%
manganese	129	130	0.8%
potassium	104000	108000	3.8%
sodium	2420000	2400000	0.8%

The results for aluminum in samples 039GW01006 and 039HW01006 and for arsenic in samples 039GW01506 and 039HW01506 were flagged as estimated (J) since their RPD's exceeded the 30% QC limit for water samples.

X.) Graphite Furnace Atomic Absorption QC (GFAA):

Graphite Furnace analyses were not used for the samples in this SDG. No action was necessary.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was required.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria were met. No action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe / Allen & Hoshall
SITE NAME: Charleston Naval Base, Zone A
SERVICE ORDER NUMBER: 0151
CONTRACTED LAB: CEIMIC, Inc.
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3-90 or SW-846
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994; USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994
SAMPLE MATRIX: Water
TYPES OF ANALYSES: Volatile Organics, Semivolatile Organics, Pesticides/PCB's, Total Metals, Cyanide, Chlorides, Sulfates, Total Dissolved Solids (TDS), Total Recoverable Petroleum Hydrocarbons - Diesel Range (TRPH-DRO), Total Recoverable Petroleum Hydrocarbons - Gasoline Range (TRPH-GRO)
SDG NUMBER: 6382 (Level III)

Client Sample #	Lab Sample #	Matrix	Volatile Organics	Semi- volatiles	Pesticides/ PCB's	Total Metals
002GW00304	6382.02	Water			X	X
002GW00304DL	6382.02DL	Water			+	
002GW00204	6382.01	Water				X
002GW00304	6382.02	Water				X
002GW00404	6382.03	Water				X
002GW00604	6395.02	Water				X
038GW00104	6423.04	Water			X	X
038GW00104DL	6423.04DL	Water			+	
038GW00204	6414.02	Water			X	X
038GW01D04	6414.01	Water			X	X
039GW00104	6395.03	Water	X	+		X
039GW00104RE	6395.03RE	Water		X		
039GW00204	6414.03	Water	X	+		X
039GW00204RE	6414.03RE	Water		X		
039GW00304	6414.04	Water	X	X		X
039GW00404	6423.01	Water	X	X		X
039GW00404RE	6423.01RE	Water		+		

Client	Lab		Volatile	Semi-	Pesticides/	Total
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Organics</u>	<u>volatiles</u>	<u>PCB's</u>	<u>Metals</u>
039GW00504	6423.03	Water	X	X	X	X
039GW00504RE	6423.03RE	Water		+		
039GW04D04	6423.02	Water	X	X		X
042GW00104	6423.05	Water	X			X
042GW00204	6423.06	Water	X			X
042GW00304	6423.07	Water	X			X
039TW00104	6395.04	Water	X			
039TW00304	6416.06	Water	X			
039TW00504	6423.08	Water	X			
039GW00204MS	6414.03MS	Water	+			
039GW00204MSD	6414.03MSD	Water	+			
042GW00204MS	6423.06MS	Water	+			
042GW00204MSD	6423.06MSD	Water	+			

DL = DILUTION, MS = MATRIX SPIKE, MSD = MATRIX SPIKE DUPLICATE,
RE = REANALYSIS, T = TRIP BLANK

Client	Lab		Cyanide	TRPH-DRO	TRPH-GRO
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>			
039GW00504	6423.03	Water	X	X	X
039GW00504MS	6423.03MS	Water	+		
039GW00504MD	6423.03MD	Water	+		

MS = MATRIX SPIKE, MD = MATRIX DUPLICATE

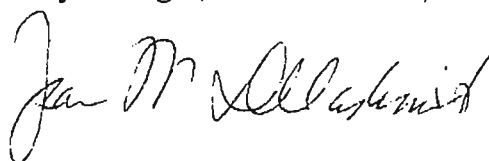
Client	Lab		Chlorides	Sulfates	TDS
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>			
002GW00104	6395.01	Water	X	X	X
002GW00204	6382.01	Water	X		X
002GW00304	6382.02	Water	X		X
002GW00404	6382.03	Water	X		X
002GW00604	6395.02	Water	X	X	X
038GW00104	6423.04	Water	X	X	X
038GW00204	6414.02	Water	X	X	X
038GW01D04	6414.01	Water	X	X	X
039GW00104	6395.03	Water	X	X	X
039GW00204	6414.03	Water	X	X	X
039GW00304	6414.04	Water	X	X	X
039GW00404	6423.01	Water	X	X	X
039GW00504	6423.03	Water	X	X	X
039GW04D04	6423.02	Water	X	X	X
002GW00104MS	6395.01MS	Water	+		
002GW00104MSD	6395.01MSD	Water	+		
002GW00304MS	6382.02MS	Water	+		
002GW00304MSD	6382.02MSD	Water	+		

Client	Lab				
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Chlorides</u>	<u>Sulfates</u>	<u>TDS</u>
002GW00604MS	6395.02MS	Water		+	
002GW00604MSD	9365.02MSD	Water		+	
039GW00304MS	6414.04MS	Water	+	+	
039GW00304MSD	6414.04MSD	Water	+	+	
039GW04D04MS	6423.02MS	Water	+		
039GW04D04MSD	6423.02MSD	Water	+		

MS = MATRIX SPIKE, MSD = MATRIX SPIKE DUPLICATE

DATA REVIEWER(S): Amy L. Hogan, Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

CEIMIC, Inc. - 6382 CLP Organics and Inorganics

SAMPLES: 002GW00104, 002GW00204, 002GW00304, 002GW00304DL, 002GW00404, 002GW00604, 038GW00104, 038GW00104DL, 038GW00204, 038GW01D04, 039GW00104, 039GW00104RE, 039GW00204, 039GW00204RE, 039GW00304, 039GW00404, 039GW00404RE, 039GW00504, 039GW00504RE, 039GW04D04, 042GW00104, 042GW00204, 042GW00304, 039TW00104, 039TW00304, 039TW00504, 002GW00104MS, 002GW00104MSD, 002GW00304MS, 002GW00304MSD, 002GW00604MS, 002GW00604MSD, 039GW00304MS, 039GW00304MSD, 039GW00504MS, 039GW00504MSD, 042GW00204MS, 042GW00204MSD

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviation (%RSD) was 31.9% for bromoform in the standards analyzed on 10/09/96 on instrument HP4, which exceeded the 30% QC limit. There were no positive results for this compound in the associated samples, so no action was required.

Continuing Calibration:

The Relative Response Factor (RRF) for 2-chloroethyl vinyl ether was 0.035 for the standard analyzed on 10/14/96 at 13:11 on instrument HP4, which was below the 0.050 QC limit. The results for this compound in associated sample 039GW00104 and trip blank 039TW00104, which consisted entirely of non-detects, were rejected (R).

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 10/14/96 at 13:11 on instrument HP4 for the following compounds:

2-chloroethyl vinyl ether	58.6%
acetone	45.5%
2-butanone	26.0%

The results for 2-chloroethyl vinyl ether in the associated samples were previously rejected. The results for the other compounds in associated sample 039GW00104, which were both non-detects, were flagged as estimated (UJ).

The Relative Response Factor (RRF) for 2-chloroethyl vinyl ether was 0.032 for the standard analyzed on 10/16/96 at 19:57 on instrument HP4, which was below the 0.050 QC limit. The non-detect result for this compound in associated sample 039GW00404 was rejected (R).

The Percent Differences (%D's) exceeded the 25% QC limit for the standards analyzed on 10/16/96 at 19:57 on instrument HP4 for the following compounds:

2-chloroethyl vinyl ether	61.6%
bromomethane	39.9%
chloroethane	53.0%
acetone	40.5%

The result for 2-chloroethyl vinyl ether in the associated sample was previously rejected. The results for the other compounds in associated sample 039GW00404, which consisted entirely of non-detects, were flagged as estimated (UJ).

The Relative Response Factor (RRF) for 2-chloroethyl vinyl ether was 0.048 for the standard analyzed on 10/17/96 at 16:23 on instrument HP4, which was below the 0.050 QC limit. The results for this compound in associated sample 042GW00104 and trip blank 039TW00504, which were both non-detects, were rejected (R).

The Percent Differences (%D's) exceeded the 25% QC limit for the standards analyzed on 10/17/96 at 16:23 on instrument HP4 for the following compounds:

2-chloroethyl vinyl ether	42.0%
bromoform	28.3%

The associated sample result for 2-chloroethyl vinyl ether was previously rejected. The non-detect result for bromoform in associated sample 042GW00104, was flagged as estimated (UJ).

The Percent Differences (%D's) exceeded the 25% QC limit for the standards analyzed on 10/22/96 at 02:58 on instrument HP4 for the following compounds:

chloromethane	28.7%
2-chloroethyl vinyl ether	38.3%
2-butanone	29.4%
vinyl acetate	36.5%
bromoform	43.4%

The results for these compounds in associated samples 039GW00504, 042GW00204 and 042GW00304, which consisted entirely of non-detects, were flagged as estimated (UJ).

IV.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was required.

Trip Blanks:

There were no positive detections in the trip blanks in this SDG. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was required.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

All MS / MSD criteria were met. No action was required.

VII.) Laboratory Control Samples (LCS):

Five LCS's were analyzed for this SDG. All Recovery criteria were met. No action was taken.

VIII.) Field Duplicates:

There were no field duplicate samples in this SDG, so no action was required.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

The non-detect results for 2-chloroethyl vinyl ether in samples 039GW00104, 039GW010404 and 042GW00104 and trip blanks 039TW00104 and 039TW00504 were rejected based on low RRF's in the continuing calibrations. All other laboratory data were acceptable with qualifications.

SEMI-VOLATILE ORGANICS

I.) Holding Times:

The 17 days between sample date and reextraction date for sample 039GW00204RE exceeded the 7 day QC limit. All results for this sample, which consisted entirely of non-detects, were flagged as estimated (UJ).

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviation (%RSD) was 37.7% for 3-nitroaniline in the standards analyzed on 10/03/96 on instrument HP7, which exceeded the 30% QC limit. Since there were no positive results for this compound in the associated samples, no action was required.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 10/18/96 at 08:14 on instrument HP5 for the following compounds:

benzoic acid	34.4%
4-chloroaniline	29.9%
hexachlorobutadiene	37.1%
hexachlorocyclopentadiene	40.9%
3-nitroaniline	48.1%
2,4-dinitrophenol	43.3%
4-nitroaniline	37.0%
4,6-dinitro-2-methylphenol	26.2%
3,3'-dichlorobenzidine	34.9%

The results for these compounds in associated sample 039GW00104RE, which consisted entirely of non-detects, were flagged as estimated (UJ).

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 10/18/96 at 11:57 on instrument HP7 for the following compounds:

2,2'-oxybis(1-chloropropane)	34.4%
benzoic acid	29.0%
2,4-dinitrophenol	61.3%
3,3'-dichlorobenzidine	53.2%

The results for these compounds in associated samples 039GW00404, 039GW00504 and 039GW04D04, which consisted entirely of non-detects, were flagged as estimated (UJ).

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 10/28/96 at 11:37 on instrument HP3 for the following compounds:

n-nitroso-di-n-propylamine	25.7%
hexachlorobutadiene	30.3%
hexachlorocyclopentadiene	33.0%
2,4-dinitrophenol	34.6%
hexachlorobenzene	46.5%
pentachlorophenol	54.9%
pyrene	40.4%
bis(2-ethylhexyl)phthalate	41.9%
di-n-octylphthalate	37.6%

The results for these compounds in associated sample 039GW00204RE, which consisted entirely of non-detects, were flagged as estimated (UJ).

IV.) Blanks:

There were no positive detections in the method blanks. No action was required.

V.) Surrogate Recoveries:

The Percent Recoveries (%R's) of surrogates were outside their respective QC limits for the following samples:

<u>Client Sample</u>	<u>Surrogate</u>	<u>%R</u>	<u>QC Limits</u>
039GW00404	phenol-d6	4	10-94%
	2-fluorophenol	0	21-100%
	2,4,6-tribromophenol	0	10-123%
	2-chlorophenol	0	33-110%
039GW00504	2-fluorophenol	6	21-100%
	2,4,6-tribromophenol	8	10-123%
	2-chlorophenol	16	33-110%

The results for the acid compounds in both of these samples, which consisted entirely of non-detects, were rejected (R), since the %R's for several of the acid surrogates were less than 10%. The four acid surrogates in sample 039GW00204 had recoveries 0% to 3%, which would cause all acid compound results to be rejected. All surrogates were within the QC limits for the reanalysis.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD analyses were not performed for this fraction of the SDG. No action was taken.

VII.) Laboratory Control Samples (LCS):

Six LCS's were analyzed for this SDG. Several Percent Recoveries (%R's) were outside the QC limits. Data validation action based on LCS criteria was not required. No action was taken.

VIII.) Field Duplicates:

There were no field duplicate samples for this fraction in this SDG, so no action was required.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

The original analyses of samples 039GW00404 and 039GW00504 were considered by the validator to be of preferable data quality to the reanalyses based on holding times and surrogate recoveries.

The reanalyses of samples 039GW00104 and 039GW00204 were considered by the validator to be of preferable data quality to the original analyses because of improved surrogate recoveries.

The non-detect results for the acid compounds in samples 039GW00404 and 039GW00504 were rejected (R) since the surrogate percent recoveries were less than 10%. All other laboratory data were acceptable with qualifications.

PESTICIDES/PCB's

I.) Holding Times:

All Holding Time criteria were met, so no action was required.

II.) Instrument Performance:

All Instrument Performance criteria were met. No action was required.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met, so no action was necessary.

Continuing Calibration:

All Continuing Calibration criteria were met. No action was required.

IV.) Blanks:

There were no positive detections in the method blanks. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD analyses were not performed for this fraction of the SDG. No action was required.

VII.) TCL Compound Identification:

Pesticide/PCB Identification Summary (PIS):

All PIS Identification criteria were met. No action was required.

VIII.) Field Duplicates:

There were no field duplicate samples for this fraction in this SDG. No action was necessary.

IX.) Pesticide Cleanup Check:

Florisil Cartridge Check:

All criteria were met, so no action was taken.

Gel Permeation Chromatography (GPC):

All GPC criteria were met. No action was necessary.

X.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

TOTAL METALS AND CYANIDE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met, so no action was necessary.

Continuing Calibration Verification (CCV):

All Continuing Calibration criteria were met. No action was required.

III.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Max. Conc.</u>	<u>Action Level</u>
CCB4	aluminum	67.8 ug/L	339 ug/L
PBW	barium	0.27 ug/L	1.35 ug/L
PBW	calcium	46.1 ug/L	231 ug/L
CCB4	chromium	0.80 ug/L	4.00 ug/L
CCB4	lead	1.40 ug/L	7.00 ug/L
CCB4	magnesium	5.50 ug/L	27.5 ug/L
PBW	potassium	51.1 ug/L	256 ug/L
PBW	sodium	6.80 ug/L	34.0 ug/L
ICB	vanadium	0.50 ug/L	2.50 ug/L
PBW	zinc	7.24 ug/L	36.2 ug/L

CCB = Continuing Calibration Blank, ICB = Initial Calibration Blank, PBW= Preparation Blank (Water)

All results greater than the IDL but less than 5X the blank amounts (Action Level, ug/L for water samples) for which the contaminated blank was an associated calibration or preparation blank were flagged as undetected (U).

The following analytes had negative results with absolute values greater than the IDL:

<u>Blank</u> <u>Type/ID#</u>	<u>Analyte</u>	<u>Neg. Conc.</u>	<u>5X Conc.</u>
CCB4	copper	-2.30 ug/L	11.5 ug/L
ICB	mercury	-0.20 ug/L	1.00 ug/L

CCB = Continuing Calibration Blank, ICB = Initial Calibration Blank

All associated positive sample results less than 5X the absolute value of the negative blank results and all associated non-detects were flagged as estimated (J) and (UJ).

IV.) ICP Interference Check Sample Results:

All Percent Recovery criteria were met, so no action was taken.

The following analytes were detected in ICS Solution A at concentrations greater than the IDL:

arsenic	4 ug/L
cadmium	1 ug/L
lead	6 ug/L
manganese	4 ug/L
selenium	2 ug/L
thallium	10 ug/L
zinc	11 ug/L

These analytes should not be present. Since neither aluminum, calcium, iron nor magnesium was present in the samples at a concentration comparable to or greater than the amount in Solution A, no action was required.

Negative results were observed in ICS Solution A at an absolute concentration greater than the IDL for the following analytes:

barium	5 ug/L
chromium	7 ug/L
cobalt	2 ug/L
copper	8 ug/L
nickel	9 ug/L
silver	4 ug/L
vanadium	2 ug/L

Since neither aluminum, calcium, iron nor magnesium was present in the samples at a concentration comparable to or greater than the amount in Solution A, no action was required.

V.) ICP Serial Dilution Analysis:

The Percent Difference (%D) for potassium was 33.4% for serial dilution sample 002GW00204L, which exceeded the 10% QC limit. All positive results for this analyte in the associated water samples

were flagged as estimated (J).

VI.) Laboratory Control Samples (LCS):

All LCS Recovery criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

All Duplicate Sample Analysis (cyanide only) criteria were met. No action was required.

VIII.) Matrix Spike Recoveries:

All Matrix Spike Recovery (cyanide only) criteria were met. No action was required.

IX.) Field Duplicates:

There were no field duplicate samples identified in this SDG. No action was required.

X.) Graphite Furnace Atomic Absorption QC (GFAA):

Graphite Furnace analyses were not used for the samples in this SDG. No action was required.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was required.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria were met, so no action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

TOTAL RECOVERABLE PETROLEUM HYDROCARBONS - DIESEL RANGE (TRPH-DRO)

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

There were no positive detections in the method blanks. No action was necessary.

IV.) Surrogates:

All Surrogate Recovery criteria were met. No action was required.

V.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

MS / MSD analyses were not performed for this fraction of the SDG. No action was required.

VII.) Field Duplicates:

There were no field duplicate samples identified in this SDG. No action was required.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualifications.

TOTAL RECOVERABLE PETROLEUM HYDROCARBONS - GASOLINE RANGE (TRPH-GRO)

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was required.

III.) Blanks:

There were no positive detections in the method blanks. No action was necessary.

IV.) Surrogates:

All Surrogate Recovery criteria were met. No action was required.

V.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

MS / MSD analyses were not performed for this fraction of the SDG. No action was required.

VII.) Field Duplicates:

There were no field duplicate samples identified in this SDG. No action was required.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualifications.

CHLORIDES

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

There were no positive detections in the method blanks. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

All MS / MSD criteria were met. No action was required.

VI.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was required.

VII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualifications.

SULFATES

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

There were no positive detections in the method blanks. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

MS / MSD analyses were not performed in this fraction of the SDG. No action was required.

VI.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was required.

VII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualifications.

TOTAL DISSOLVED SOLIDS (TDS)

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

There were no positive detections in the method blanks. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

MS / MSD analyses were not performed in this fraction of the SDG. No action was required.

VI.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was required.

VII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualifications.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe / Allen & Hoshall
SITE NAME: Charleston Naval Base, Zone A
SERVICE ORDER NUMBER: 0152
CONTRACTED LAB: Ceimic / Maxwell S-Cubed Division
QA/QC LEVEL: EPA Level IV
EPA METHOD: EPA SOW 3-90 or SW-846
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994; USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994

SAMPLE MATRIX: Water
TYPES OF ANALYSES: Volatile Organics, Semivolatile Organics, Pesticides/PCB's, Total Metals and Cyanide, Hexavalent Chromium (HexaCr), Chlorides, Sulfates, Total Dissolved Solids (TDS)

SDG NUMBER: 6414 (Level IV)

SAMPLES:

Client <u>Sample #</u>	Lab <u>Sample #</u>	<u>Matrix</u>	<u>Volatile Organics</u>	<u>Semi- volatiles</u>	<u>Pesticides/ PCB's</u>
039HW00304	6414.05	Water	X	X	
039HW01104	6450.05	Water	X	X	
039HW01104DL	6450.05DL	Water	+	+	
GDAGW00204	6468.01	Water	X		
506DW00104	6434.03	Water	X	X	X
506EW00104	6434.04	Water	X	X	X
506FW00104	6434.05	Water	X	X	X
039HW00304MS	6414.05MS	Water	+		
039HW00304MSD	6414.05MSD	Water	+		

Client <u>Sample #</u>	Lab <u>Sample #</u>	<u>Matrix</u>	<u>Total Metals</u>	<u>Cyanide</u>	<u>HexaCr</u>
039HW00304	6414.05	Water	X		
039HW01104	6450.05	Water	X		
GDAGW00204	6468.01	Water	X	X	X
506DW00104	6434.03	Water	X	X	X
506EW00104	6434.04	Water	X	X	X
506FW00104	6434.05	Water	X	X	X

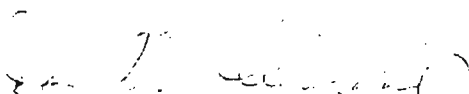
Client	Lab		Total		
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Metals</u>	<u>Cyanide</u>	<u>HexaCr</u>
GDAGW00204MD	6468.01D	Water	+		
GDAGW00204S	6468.01S	Water	+		
506FW00104MD	6434.05D	Water		+	+
506FW00104S	6434.05S	Water		+	+

Client	Lab				
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Chlorides</u>	<u>Sulfates</u>	<u>TDS</u>
039HW00304	6414.05	Water	X	X	X
039HW01104	6450.05	Water	X	X	X
GDAGW00204	6468.01	Water	X	X	X
506DW00104	6434.03	Water	X	X	X
506EW00104	6434.04	Water	X	X	X
506FW00104	6434.05	Water	X	X	X
506DW00104MD	6450.03D	Water	+	+	
506DW00104S	6450.03S	Water	+	+	
039HW00304MD	6414-05D	Water			+

DL = DILUTION, DW = DEIONIZED WATER BLANK, EW = EQUIPMENT RINSATE BLANK,
FW = FIELD BLANK, MD = MATRIX DUPLICATE, MS / S = MATRIX SPIKE, MSD = MATRIX
SPIKE DUPLICATE

DATA REVIEWER(S): Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Ceimic / Maxwell S-Cubed Division - Appendix IX CLP Organics and Inorganics

SAMPLES: 039HW00304, 039HW01104, 039HW01104DL, GDAGW00204, 506DW00104, 506EW00104, 506FW00104, 039HW00304MS, 039HW00304MSD, GDAGW00204MD, GDAGW00204S, 506FW00104MD, 506FW00104S, 506DW00104MD, 506DW00104S, 039HW00304MD

VOLATILE ORGANICS

I.) Holding Times:

The holding time from sampling date to analysis date was 29 days for field blank 506FW00104, which exceeded by more than 2X the 14 day holding time. The positive result for chloroform in this sample was flagged as estimated (J) and all other results, which consisted entirely of non-detects, were rejected (R).

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

The average Relative Response Factors (RRF's) were below the 0.050 QC limit for the standards analyzed on 10/18/96 on instrument HP for the following compounds:

acrolein	0.008
propionitrile	0.009
acetonitrile	0.012
1,4-dioxane	0.009
isobutyl alcohol	0.037

All results for these compounds in the SDG samples, which consisted entirely of non-detects, were rejected (R).

Continuing Calibration:

The Relative Response Factors (RRF's) were below the 0.050 QC limit for the standard analyzed on 10/22/96 at 23:47 on instrument HP for the following compounds:

propionitrile	0.008
acetonitrile	0.012
1,4-dioxane	0.010
isobutyl alcohol	0.032

The non-detect results for these compounds in the associated samples were previously rejected based on low RRF's in the initial calibration. No further action was necessary.

The Relative Response Factors (RRF's) were below the 0.050 QC limit for the standard analyzed on 10/23/96 at 16:59 on instrument HP for the following compounds:

propionitrile	0.009
acetonitrile	0.012
1,4-dioxane	0.010
isobutyl alcohol	0.034

The non-detect results for these compounds in the associated samples were previously rejected based on low RRF's in the initial calibration. No further action was required.

IV.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was taken.

Deionized Water, Equipment Rinsate and Field Blanks:

Chloroform was detected at 14 ug/L, 12 ug/L and 13 ug/L, respectively, in deionized water blank 506DW00104, equipment rinsate blank 506EW00104 and field blank 506FW00104. Since there were no positive results in the associated samples for this compound, no action was necessary.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was required.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

All MS / MSD criteria were met. No action was required.

VII.) Laboratory Control Samples (LCS):

Four LCS's were analyzed for this SDG. All Recovery criteria were met. No action was taken.

VIII.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was required.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

Sample 039HW01104 was diluted and reanalyzed because benzene (200 ug/L) was at the same concentration level as the highest calibration standard. The result for the dilution verified the original analysis. The dilution value was not transcribed to the original sample data. All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

The non-detect results for acrolein, propionitrile, acetonitrile, 1,4-dioxane and isobutyl alcohol were rejected in all SDG samples because of low RRF's in the initial calibration. All non-detect results for field blank 506FW00104 were rejected because of excessive holding time to analysis. All other laboratory data were acceptable without qualification.

SEMIVOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviation (%RSD) for 3-nitroaniline was 37.7%, which exceeded the 30% QC limit for the standards analyzed on 10/3/96 on instrument HP7. Since this compound was not detected in the associated samples, no action was necessary.

The Percent Relative Standard Deviations (%RSD's) for hexachlorocyclopentadiene (47.0%), phenanthrene (31.3%) and methapyrilene (37.4%) exceeded the 30% QC limit for the standards analyzed on 11/4/96 on instrument HP7. Since there were no positive detections of these compounds in the associated samples, no action was necessary.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 10/31/96 at 14:54 on instrument HP7 for the following compounds:

3-nitroaniline	30.0%
2,4-dinitrophenol	61.3%
4,6-dinitro-3-methylphenol	29.9%
3,3'-dichlorobenzidine	53.2%

The non-detect results for these compounds in associated sample 039HW00304 were flagged as estimated (UJ).

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 11/11/96 at 14:44 on instrument HP7 for the following compounds:

2,2'-oxybis(1-chloropropane)	35.9%
a,a-dimethylphenethylamine	34.5%
benzoic acid	52.9%
p-phenylenediamine	27.4%
isosafole	89.1%
2,4-dinitrophenol	34.9%
4-nitrophenol	28.0%

The non-detect results for these compounds in associated samples 039HW001104 and 039HW01104DL were flagged as estimated (UJ).

IV.) Blanks:

Method Blank:

There were no positive detections in the method blank. No action was required.

Deionized Water, Equipment Rinse and Field Blanks:

There were no positive detections in the three field blanks in this SDG. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was taken.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD analyses were not performed in this fraction of the SDG. No action was necessary.

VII.) Laboratory Control Samples (LCS):

Three LCS's were analyzed in this SDG. All Percent Recovery criteria were met. No action was taken.

VIII.) Field Duplicates:

There were no field duplicate samples in this SDG, so no action was required.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

The concentration of naphthalene in sample 039HW01104 exceeded the standard calibration range. The concentration of this compound in the original analysis was replaced by the validator with the diluted sample (039HW01104DL) result with appropriate qualifiers.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

PESTICIDES/PCB's

I.) Holding Times:

All Holding Time criteria were met, so no action was required.

II.) Instrument Performance:

All Instrument Performance criteria were met. No action was necessary.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met, so no action was necessary.

Continuing Calibration:

All Continuing Calibration criteria were met. No action was required.

IV.) Blanks:

Method Blank:

There were no positive detections in the method blank. No action was required.

Deionized Water, Equipment Rinsate and Field Blanks:

There were no positive detections in the three field blanks. No action was necessary.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Laboratory Control Samples (LCS):

Two LCS's were analyzed by the laboratory. All Percent Recovery criteria were met. No action was taken.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD analyses were not performed in this fraction of the SDG. No action was required.

VIII.) TCL Compound Identification:

Pesticide/PCB Identification Summary (PIS):

All PIS Identification criteria were met. No action was required.

IX.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was necessary.

X.) Pesticide Cleanup Check:

Florisil Cartridge Check:

All criteria were met, so no action was taken.

Gel Permeation Chromatography (GPC):

GPC sample cleanup was not required for this SDG. No action was necessary.

XI.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

TOTAL METALS AND CYANIDE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was required.

III.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Max. Conc.</u>	<u>Action Level</u>
CCB1	aluminum	1.55 ug/L	7.75 ug/L
FW	barium	0.66 ug/L	3.30 ug/L
EW	beryllium	0.21 ug/L	1.05 ug/L
FW	cadmium	0.29 ug/L	1.45 ug/L
FW	calcium	62.7 ug/L	314 ug/L
FW	chromium	0.86 ug/L	4.30 ug/L
CCB1	cobalt	1.00 ug/L	5.00 ug/L
DW	copper	38.4 ug/L	192 ug/L
DW	iron	46.2 ug/L	231 ug/L
CCB1	magnesium	15.2 ug/L	76.0 ug/L
CCB1	nickel	0.60 ug/L	3.00 ug/L
FW	potassium	113 ug/L	565 ug/L
PBW	silver	4.57 ug/L	22.9 ug/L
FW	sodium	6760 ug/L	33800 ug/L
ICB	thallium	4.30 ug/L	21.5 ug/L
DW	zinc	10.3 ug/L	51.5 ug/L

CCB = Continuing Calibration Blank, PBW= Preparation Blank (Water),
 ICB = Initial Calibration Blank, DW = Deionized Water Blank (506DW00104),
 EW = Equipment Rinsate Blank (506EW00104), FW = Field Blank (506FW00104)

All results greater than the IDL but less than 5X the blank amounts (Action Level, ug/L for water samples) for which the contaminated blank was an associated calibration, preparation, deionized water, equipment rinsate or field blank were flagged as undetected (U).

The following analytes had negative results with absolute values greater than the IDL in the continuing calibration blanks (CCB's):

<u>Blank ID</u>	<u>Analyte</u>	<u>Neg. Conc.</u>	<u>5X Conc.</u>
CCB1	arsenic	-3.00 ug/L	15.0 ug/L
CCB2	zinc	-3.20 ug/L	16.0 ug/L

All associated positive sample results less than 5X the absolute value of the negative blank results and all associated non-detects were flagged as estimated (J) and (UJ).

IV.) ICP Interference Check Sample Results:

All Percent Recovery criteria were met, so no action was taken.

The following analytes were detected in ICS Solution A at positive concentrations greater than the IDL:

arsenic	2 ug/L
manganese	5 ug/L
selenium	4 ug/L
thallium	11 ug/L

These analytes should not be present. Since neither aluminum, calcium, iron nor magnesium was present in the samples at a concentration comparable to or greater than the amount in Solution A, no action was required.

Negative results were observed in ICS Solution A at an absolute concentration greater than the IDL for the following analytes:

beryllium	-15 ug/L
cadmium	-1 ug/L
chromium	-7 ug/L
cobalt	-3 ug/L
copper	-8 ug/L
nickel	-10 ug/L
silver	-4 ug/L
sodium	-244 ug/L
tin	-57 ug/L
vanadium	-1 ug/L

Since neither aluminum, calcium, iron nor magnesium was present in the samples at a concentration

comparable to or greater than the amount in Solution A, no action was required.

V.) ICP Serial Dilution Analysis:

The ICP Serial Dilution Analysis Percent Differences (%D's) for aluminum (38.8%), silver (16.1%) and sodium (36.6%) exceeded the 10% QC limit for dilution sample GDAGW00204L. All positive results for these analytes in the associated samples were flagged as estimated (J).

VI.) Laboratory Control Samples (LCS):

All LCS Recovery criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

The Relative Percent Difference (RPD) was 36.1% for aluminum in duplicate sample GDAGW00204MD, which exceeded the 20% QC limit for water samples. The positive result for this analyte in associated samples 039HW00304, 039HW01104 and GDAGW00204 were flagged as estimated (J).

VIII.) Spike Recovery:

The Percent Recovery (%R) of aluminum was -71.4% for spiked sample GDAGW00204S, which was below the 75-125% QC limits. The positive results for this analyte in associated samples 039HW00304, 039HW01104 and GDAGW00204 were previously qualified based on Duplicate Sample criteria. No further action was necessary.

IX.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was taken.

X.) Graphite Furnace Atomic Absorption QC (GFAA):

Graphite Furnace analyses were not used for the samples in this SDG.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was required.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria were met, so no action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

HEXAVALENT CHROMIUM (HexaCr)

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blanks:

Hexavalent chromium was not detected in the method blanks. No action was necessary.

Deionized Water, Equipment Rinsate and Field Blanks:

Hexavalent chromium was not detected in the three field blanks. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was required.

V.) Duplicate Sample Analysis:

All Duplicate Sample Analysis criteria were met. No action was taken.

VI.) Matrix Spike Recovery (MS):

All MS Recovery criteria were met. No action was required.

VII.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was necessary.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

CHLORIDES

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Chlorides were detected at 2.0 mg/L in method blanks. The field blank was used for blank qualification. No further action was necessary.

Deionized Water and Equipment Rinsate Blanks:

Chlorides were detected at 19.0 mg/L and 21.0 mg/L, respectively, in deionized water blank 506DW00104 and equipment rinsate blank 506EW00104. The field blank was used for blank qualification. No further action was necessary.

Field Blank:

Chlorides were detected at 23.0 mg/L in field blank 506FW00104. The positive result for chlorides in associated sample 039HW00304, which was less than 5X the blank amount, was flagged as undetected (U) with the detection limit being raised to the amount of contamination in the sample. No further action was required.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

All Duplicate Sample Analysis criteria were met. No action was taken.

VI.) Matrix Spike Recovery (MS):

All MS Recovery criteria were met. No action was required.

VII.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was necessary.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualification.

SULFATES

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blanks:

Sulfates were not detected in the method blanks. No action was necessary.

Deionized Water, Equipment Rinsate and Field Blanks:

Sulfates were not detected in the equipment rinsate blank. Sulfates were detected at 10.0 mg/L in both deionized water blank 506DW00104 and field blank 506FW00104. The positive result for sulfates in associated sample 039HW00304, which was less than 5X the blank amounts, was flagged as undetected (U) with the detection limit being raised to the amount of contamination in the sample. No further action was required.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

All Duplicate Sample Analysis criteria were met. No action was taken.

VI.) Matrix Spike Recovery (MS):

All MS Recovery criteria were met. No action was required.

VII.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was necessary.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualification.

TOTAL DISSOLVED SOLIDS (TDS)

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blanks:

TDS was not detected in the method blanks. No action was necessary.

Deionized Water and Field Blanks:

TDS was detected at 30.0 mg/L in deionized water blank 506DW00104 and 28.0 mg/L in field blank 506FW00104. Since the equipment rinsate blank was used for blank qualifications, no further action was necessary.

Equipment Rinsate Blank:

TDS was detected at 86.0 mg/L in field blank 506FW00104. The positive detections of TDS in associated samples 039HW00304 and 039HW01104, which were less than 5X the blank amount, were flagged as undetected (U) with the detection limit being raised to the amount of contamination in each sample. No further action was required.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

All Duplicate Sample Analysis criteria were met. No action was taken.

VI.) Matrix Spike Recovery (MS):

MS analysis was not required for TDS. No action was required.

VII.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was necessary.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe / Allen & Hoshall
SITE NAME: Charleston Naval Base, Zone A
SERVICE ORDER NUMBER: 0163
CONTRACTED LAB: Ceimic / Maxwell, S-Cubed Division
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3-90 or SW-846
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994; USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994

SAMPLE MATRIX: Water
TYPES OF ANALYSES: Volatile Organics, Semivolatile Organics, Pesticides/PCB's, Total Metals, Cyanide, Hexavalent Chromium (HexaCr), Chlorides, Sulfates, Total Dissolved Solids (TDS)

SDG NUMBER: 6434 (Level III)

SAMPLES:

Client <u>Sample #</u>	Lab <u>Sample #</u>	<u>Matrix</u>	<u>Volatile Organics</u>	<u>Semi- volatiles</u>	<u>Pesticides/ PCB's</u>
039GW00604	6434-06	Water	X	X	
039GW00704	6437-01	Water	X	X	
039GW00804	6437-02	Water	X	X	
039GW00904	6437-03	Water	X	X	
039GW01004	6437-04	Water	X	X	
039GW01104	6450-06	Water	X	X	
039GW01104DL	6450-06DL	Water	+	+	
039GW01204	6458-03	Water	X	X	
039GW01204RE	6458-03RE	Water		+	
039GW08D04	6450-03	Water	X	X	
039GW08D04RE	6450-03RE	Water		+	
039GW12D04	6458-05	Water	X	X	
039GW12I04	6458-04	Water	X	+	
039GW12I04DL	6458-04DL	Water	+		
039GW12I04RE	6458-04RE	Water		X	
505GW00104	6443-01	Water	X		
506GW00104	6434-02	Water	X	X	
GDAGW00104	6450-01	Water	X		

Client	Lab		Volatile	Semi-	Pesticides/
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Organics</u>	<u>volatiles</u>	<u>PCB's</u>
GDAGW00304	6458-01	Water	X		
GDAGW01D04	6450-02	Water	X		
GDAGW03D04	6458-02	Water	X		
039DW12I04	6458-06	Water	X	X	X
039DW12I04RE	6458-06RE	Water			+
039EW12I04	645807	Water	X	X	X
039FW12I04	6458-08	Water	X	X	X
039FW12I04RE	6458-08RE	Water			+
039TW01004	6437-05	Water	X		
039TW01104	6450-06	Water	X		
039TW12D04	6458-09	Water	X		
506TW00104	6434-07	Water	X		
GDAGW03D04MS	6458-02MS	Water	+		
GDAGW03D04MSD	6458-02MSD	Water	+		

Client	Lab		Total		
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Metals</u>	<u>Cyanide</u>	<u>HexaCr</u>
039GW00604	6434-06	Water	X		
039GW00704	6437-01	Water	X		
039GW00804	6437-02	Water	X		
039GW00904	6437-03	Water	X		
039GW01004	6437-04	Water	X		
039GW01104	6450-06	Water	X		
039GW01204	6458-03	Water	X		
039GW08D04	6450-03	Water	X		
039GW12D04	6458-05	Water	X		
039GW12I04	6458-04	Water	X		
505GW00104	6443-01	Water	X		
506GW00104	6434-02	Water	X		
GDAGW00104	6450-01	Water	X	X	X
GDAGW00304	6458-01	Water	X	X	X
GDAGW01D04	6450-02	Water	X	X	X
GDAGW03D04	6458-02	Water	X	X	X
039DW12I04	6458-06	Water	X	X	X
039EW12I04	645807	Water	X	X	X
039FW12I04	6458-08	Water	X	X	X
GDAGW03D04MD	6458-02MD	Water	+	+	+
GDAGW03D04MS	6458-02MS	Water	+	+	+

Client	Lab				
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Chlorides</u>	<u>Sulfates</u>	<u>TDS</u>
039GW00604	6434-06	Water	X	X	X
039GW00704	6437-01	Water	X	X	X
039GW00804	6437-02	Water	X	X	X
039GW00904	6437-03	Water	X	X	X
039GW01004	6437-04	Water	X	X	X
039GW01104	6450-06	Water	X	X	X
039GW01204	6458-03	Water	X	X	X

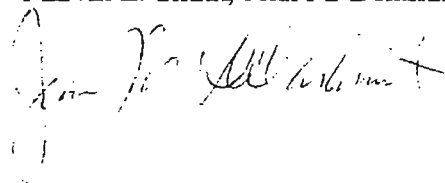
<u>Client</u> <u>Sample #</u>	<u>Lab</u> <u>Sample #</u>	<u>Matrix</u>	<u>Chlorides</u>	<u>Sulfates</u>	<u>TDS</u>
039GW08D04	6450-03	Water	X	X	X
039GW12D04	6458-05	Water	X	X	X
039GW12I04	6458-04	Water	X	X	X
GDAGW00I04	6450-01	Water	X	X	X
GDAGW00304	6458-01	Water	X	X	X
GDAGW01D04	6450-02	Water	X	X	X
GDAGW03D04	6458-02	Water	X	X	X
039DW12I04	6458-06	Water	X	X	X
039EW12I04	645807	Water	X	X	X
039FW12I04	6458-08	Water	X	X	X
GDAGW03D04MD	6458-02MD	Water	+	+	+
GDAGW03D04MS	6458-02MS	Water	+	+	

+ = Non-billable analysis

DL = DILUTION, DW = DEIONIZED WATER BLANK, EW = EQUIPMENT RINSATE BLANK,
FW = FIELD BLANK, MD = MATRIX DUPLICATE, MS = MATRIX SPIKE, MSD = MATRIX
SPIKE DUPLICATE, RE = REANALYSIS

DATA REVIEWER(S): Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions

- J - The association numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Ceirmic / Maxwell, S-Cubed Division - 6434 CLP Organics and Inorganics

SAMPLES: 039GW00604, 039GW00704, 039GW00804, 039GW00904, 039GW01004, 039GW01104, 039GW01104DL, 039GW01204, 039GW01204RE, 039GW08D04, 039GW08D04RE, 039GW12D04, 039GW12I04, 039GW12I04DL, 039GW12I04RE, 505GW00104, 506GW00104, GDAGW00104, GDAGW00304, GDAGW01D04, GDAGW03D04, 039DW12I04, 039DW12I04RE, 039EW12I04, 039FW12I04, 039FW12I04RE, 039TW01004, 039TW01104, 039TW12D04, 506TW00104, GDAGW03D04MS, GDAGW03D04MSD, GDAGW03D04MD

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met. No action was taken.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviation (%RSD) for trans-1,3-dichloropropene was 31.9% for the standards analyzed on 10/9/96 on instrument HP4, which exceeded the 30% QC limit. Since there were no positive detections of this compound in the SDG samples, no action was necessary.

Continuing Calibration:

The Percent Difference (%D) for 2-butanone was 26.5% for the standard analyzed on 10/15/96 at 03:40 on instrument HP4, which exceeded the 25% QC limit. All results for this compound in the associated samples, which consisted entirely of non-detects, were flagged as estimated (UJ). The associated samples were 039GW00704, 039GW00804, 039GW00904 and 039GW01004.

The Relative Response Factor (RRF) was 0.041 for 2-chloroethyl vinyl ether, which was below the 0.050 QC limit for the standard analyzed on 10/16/96 at 19:57 on instrument HP4. The non-detect results for this compound in associated sample 506GW00104 and trip blank 506TW00104 were rejected (R).

The Percent Difference (%D) for 2-chloroethyl vinyl ether was 50.7% for the standard analyzed on 10/16/96 at 19:57 on instrument HP4, which exceeded the 25% QC limit. The non-detect sample result

for this compound was previously rejected based on a low RRF in this calibration. No further action was required.

The Relative Response Factor (RRF) was 0.048 for 2-chloroethyl vinyl ether, which was below the 0.050 QC limit for the standard analyzed on 10/17/96 at 16:23 on instrument HP4. The non-detect results for this compound in associated samples 039GW01104, 039GW08D04, GDAGW00104 and trip blank 039TW01004 were rejected (R).

The Percent Differences (%D's) for 2-chloroethyl vinyl ether and bromoform were 42.0% and 28.3%, respectively, for the standard analyzed on 10/17/96 at 16:23 on instrument HP4, which exceeded the 25% QC limit. The non-detect results for 2-chloroethyl vinyl ether were previously rejected based on a low RRF in this calibration. The results for bromoform in associated samples 039GW01104, 039GW08D04 and GDAGW00104, which consisted entirely of non-detects, were flagged as estimated (UJ).

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 10/22/96 at 02:58 on instrument HP4 for the following compounds:

2-chloroethyl vinyl ether	38.3%
2-butanone	29.4%
vinyl acetate	36.5%
bromoform	43.3%

The non-detect results for these compounds in the associated samples were flagged as estimated (UJ). The associated samples were 039GW00604, 039GW01204, 505GW00104, GDAGW00304, GDAGW01D04 and GDAGW03D04.

The Percent Differences (%D's) for chloromethane (26.7%) and vinyl acetate (43.6%) exceeded the 25% QC limit for the standard analyzed on 10/24/96 at 19:06 on instrument HP4. The non-detect results for these compounds in the associated samples were flagged as estimated (UJ). The associated samples were 039GW12D04, 039GW12I04, 039GW12I04DL and 039GW01104DL.

IV.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was taken.

Deionized Water, Equipment Rinsate and Field Blanks:

Chloroform was detected at 7 ug/L, 11 ug/L and 12 ug/L, respectively, in deionized water blank 039DW12I04, equipment rinsate blank 039EW12I04 and field blank 039FW12I04. Since there were no positive results for this compound in the associated samples, no action was necessary.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was required.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

All MS / MSD criteria were met. No action was required.

VII.) Laboratory Control Samples (LCS):

Six LCS's were analyzed in this SDG. All Recovery criteria were met. No action was taken.

VIII.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was required.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

Sample 039GW01104 was diluted and reanalyzed because the concentration of benzene exceeded the standard calibration range. The value for this compound in the original sample was replaced with the dilution value from sample 039GW01104DL with appropriate flagging.

Sample 039HW12I04 was diluted and reanalyzed because the concentration of cis-1,2-dichloroethene exceeded the standard calibration range. The value for this compound in the original sample was replaced with the dilution value from sample 039GW12I04DL. All other CRQL criteria were met, so no further action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

The non-detect results for 2-chloroethyl vinyl ether were rejected in samples 039GW01104, 039GW08D04, GDAGW00104, 506GW00104 and trip blanks 039GW01004 and 506TW00104 because of low RRF's in the continuing calibrations. All other laboratory data were acceptable with qualifications.

SEMIVOLATILE ORGANICS

I.) Holding Times:

The holding time from sample date to reextraction date was 12 days for sample 039GW12I04RE, which exceeded the 7 day QC limit for water samples. All results for this sample, which consisted entirely of non-detects, were flagged as (UJ).

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviation (%RSD) for 3-nitroaniline was 37.7% for the standards analyzed on 10/3/96 on instrument HP7, which exceeded the 30% QC limit. Since there were no positive detections of this compound in the associated samples, no action was necessary.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 10/18/96 at 11:57 on instrument HP7 for the following compounds:

2,2'-oxybis(1-chloropropane)	34.4%
benzoic acid	29.0%
2,4-dinitrophenol	61.3%
4,6-dinitro-2-methylphenol	29.9%
3,3'-dichlorobenzidine	53.2%

The non-detect results for these compounds in associated samples 039GW00704 and 039GW00804 were flagged as estimated (UJ).

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 10/21/96 at 11:52 on instrument HP7 for the following compounds:

2,2'-oxybis(1-chloropropane)	33.7%
benzoic acid	25.7%
2,4-dinitrophenol	26.7%
4-chloroaniline	35.1%
3-nitroaniline	45.0%

The non-detect results for these compounds in associated samples 039GW00904 and 039GW01004 were flagged as estimated (UJ).

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 10/23/96 at 12:27 on instrument HP5 for the following compounds:

hexachlorocyclopentadiene	28.4%
hexachlorobutadiene	30.6%
3-nitroaniline	25.8%
4-nitroaniline	49.1%
3,3'-dichlorobenzidine	35.8%
di-n-octylphthalate	32.9%
dibenz(a,h)anthracene	27.1%

The non-detect results for these compounds in the associated samples were flagged as estimated (UJ). The associated samples were 039GW01104, 039GW01204, 039GW12D04 and 039GW08D04.

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 11/11/96 at 14:14 on instrument HP7 for the following compounds:

2,2'-oxybis(1-chloropropane)	46.5%
benzoic acid	27.2%
2,4-dinitrophenol	32.7%

The non-detect results for these compounds in associated samples 039GW00604 and 506GW00104 were flagged as estimated (UJ).

IV.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was required.

Deionized Water, Equipment Rinsate and Field Blanks:

There were no positive detections in the three field blanks in this SDG. No action was required.

V.) Surrogate Recoveries:

The Surrogate Percent Recoveries (%R's) for phenol-d6 in samples 039GW00704 (96%), 039GW01004 (99%) and 039GW01104DL (98%) exceeded the 10-94% QC limits. Since only one surrogate was outside the QC limits in the acid fraction for each sample, no action was necessary.

The Percent Recoveries (%R's) were outside their respective QC limits in sample 039GW08D04 for the following surrogates:

<u>Surrogate</u>	<u>%R</u>	<u>QC Limits</u>
phenol-d6	7	10-94%
2-fluorophenol	0	21-100%
2,4,6-tribromophenol	0	10-123%
2-chlorophenol-d4	0	33-110%

Since the %R's were less than 10%, all acid fraction compounds in this sample, which consisted entirely of non-detects, were rejected (R). The recoveries were not improved in the reanalysis.

The Percent Recoveries (%R's) were outside their respective QC limits in sample 039GW01204 for the following surrogates:

<u>Surrogate</u>	<u>%R</u>	<u>QC Limits</u>
phenol-d6	7	10-94%
2-fluorophenol	0	21-100%
2,4,6-tribromophenol	0	10-123%
2-chlorophenol-d4	5	33-110%

Since the %R's were less than 10%, all acid fraction compounds in this sample, which consisted entirely of non-detects, were rejected (R).

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD analyses were not performed in this fraction of the SDG. No action was necessary.

VII.) Laboratory Control Samples (LCS):

Three LCS's were analyzed in this SDG. All Percent Recovery criteria were met. No action was taken.

VIII.) Field Duplicates:

There were no field duplicate samples in this SDG, so no action was required.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

The concentration of naphthalene in sample 039GW01104 exceeded the standard calibration range. The concentration of this compound in the original analysis was replaced with the diluted sample (039GW01104DL) result with the appropriate flag (D).

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

The original analyses of samples 039GW01204 and 039GW08D04 were considered by the validator to be of preferable data quality as compared to the reanalyses because of better holding times and surrogate recoveries. The reanalysis of sample 039GW12I04 was considered by the validator to be of preferable data quality as compared to the original analysis because of improved surrogate recoveries.

All acid compound results in samples 039GW08D04 and 039GW01204, which consisted entirely of non-detects, were rejected because of very low surrogate recoveries (less than 10%). All other laboratory data were acceptable with qualifications.

PESTICIDES/PCB's

I.) Holding Times:

The holding time from sample date to reextraction date was 9 days for deionized water blank 039DW12I04RE and field blank 039FW12I04RE, which exceeded the 7 day QC limit for water samples. Since the two samples were field blanks, no action was necessary.

II.) Instrument Performance:

All Instrument Performance criteria were met. No action was necessary.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met, so no action was necessary.

Continuing Calibration:

All Continuing Calibration criteria were met. No action was required.

IV.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was required.

Deionized Water, Equipment Rinsate and Field Blanks:

There were no positive detections in the three field blanks. No action was necessary.

V.) Surrogate Recoveries:

The Surrogate Recoveries of decachlorobiphenyl (DCB) were below the 30-150% QC limits in deionized water blank 039DW12I04 and field blank 039FW12I04. Since all Surrogate Recovery criteria were met for the reanalyses, which were chosen for validation, no action was taken.

VI.) Laboratory Control Samples (LCS):

Two LCS's were analyzed by the laboratory. All Percent Recovery criteria were met. No action was taken.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD analyses were not performed in this fraction of the SDG. No action was required.

VIII.) TCL Compound Identification:

Pesticide/PCB Identification Summary (PIS):

All PIS Identification criteria were met. No action was required.

IX.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was necessary.

X.) Pesticide Cleanup Check:

Florisil Cartridge Check:

All criteria were met, so no action was taken.

Gel Permeation Chromatography (GPC):

GPC sample cleanup was not required for this SDG. No action was necessary.

XI.) Overall Assessment of Data/General:

The reanalyses of field blanks 039DW12I04 and 039FW12I04 were considered by the validator to be of preferable data quality as compared to the original analyses because of improved surrogate recoveries. All laboratory data were acceptable without qualifications.

TOTAL METALS AND CYANIDE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was necessary.

III.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Max. Conc.</u>	<u>Action Level</u>
CCB7	aluminum	234 ug/L	1170 ug/L
DW	barium	0.40 ug/L	2.00 ug/L
ICB	beryllium	0.30 ug/L	1.50 ug/L
EW	cadmium	0.20 ug/L	1.00 ug/L
DW	calcium	65.8 ug/L	329 ug/L
ICB	copper	35.0 ug/L	175 ug/L
CCB1	magnesium	11.8 ug/L	59.0 ug/L
PBW	manganese	1.38 ug/L	6.90 ug/L
DW	mercury	0.11 ug/L	0.55 ug/L
ICB	potassium	47.8 ug/L	239 ug/L
DW	selenium	2.70 ug/L	13.5 ug/L
EW	sodium	7350 ug/L	36800 ug/L
CCB7	zinc	84.9 ug/L	425 ug/L

CCB = Continuing Calibration Blank, PBW= Preparation Blank (Water), ICB = Initial Calibration Blank, DW = Deionized Water Blank (039DW12I04), EW = Equipment Rinsate Blank (039EW12I04), FW = Field Blank (039FW12I04)

All results greater than the IDL but less than 5X the blank amounts (Action Level, ug/L for water samples) for which the contaminated blank was an associated calibration, preparation, deionized water, equipment rinsate or field blank were flagged as undetected (U).

The following analytes had negative results with absolute values greater than the IDL:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Neg. Conc.</u>	<u>5X Conc.</u>
CCB3	aluminum	-22.0 ug/L	110 ug/L
CCB4	beryllium	-0.30 ug/L	1.50 ug/L
CCB4	calcium	-23.6 ug/L	118 ug/L
CCB4	chromium	-1.40 ug/L	7.00 ug/L
PBW	cobalt	-1.58 ug/L	7.90 ug/L
CCB4	nickel	-2.60 ug/L	13.0 ug/L
CCB7	potassium	-65.8 ug/L	329 ug/L
CCB4	silver	-1.70 ug/L	8.50 ug/L
CCB11	sodium	-4.80 ug/L	24.0 ug/L
CCB4	tin	-49.7 ug/L	249 ug/L

CCB = Continuing Calibration Blank, PBW = Preparation Blank (Water)

All associated positive sample results less than 5X the absolute value of the negative blank results and all associated non-detects were flagged as estimated (J) and (UJ).

IV.) ICP Interference Check Sample Results:

All Percent Recovery criteria were met, so no action was taken.

The following analytes were detected in ICS Solution A at concentrations greater than the IDL:

antimony	2 ug/L
arsenic	2 ug/L
cadmium	3 ug/L
manganese	6 ug/L
potassium	96 ug/L
selenium	4 ug/L
thallium	6 ug/L
tin	51 ug/L
zinc	14 ug/L

These analytes should not be present. Since neither aluminum, calcium, iron nor magnesium was present in the samples at a concentration comparable to or greater than the amount in Solution A, no action was required.

Negative results were observed in ICS Solution A at an absolute concentration greater than the IDL for the following analytes:

barium	-5 ug/L
chromium	-10 ug/L
cobalt	-3 ug/L
copper	-8 ug/L
lead	-3 ug/L
nickel	-14 ug/L
silver	-5 ug/L
sodium	-202 ug/L
vanadium	-1 ug/L

Since neither aluminum, calcium, iron nor magnesium was present in the samples at a concentration comparable to or greater than the amount in Solution A, no action was required.

V.) ICP Serial Dilution Analysis:

The ICP Serial Dilution Analysis Percent Differences (%D's) for potassium (38.4%) exceeded the 10% QC limit for dilution sample GDAGW03D04L. All positive results for this analyte in the associated samples were flagged as estimated (J).

VI.) Laboratory Control Samples (LCS):

All LCS Recovery criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

All Duplicate Sample Analysis criteria were met. No action was necessary.

VIII.) Spike Recovery:

The Percent Recoveries (%R's) were outside the 75-125% QC limits for the following analytes:

Analyte	%R
antimony	0
arsenic	0
copper	-52
iron	53
lead	0
manganese	44
mercury	61
silver	132
thallium	0
zinc	-179

All positive results for silver in the SDG samples were flagged as estimated (J). All positive and non-detect results for iron, manganese and mercury in the samples were flagged as estimated (J) and (UJ). All positive results for antimony, arsenic, copper, lead, thallium and zinc in the samples were flagged as estimated (J) and all non-detect results for these analytes in the samples and field blanks were rejected (R) since the %R's were less than 30%.

IX.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was taken.

X.) Graphite Furnace Atomic Absorption QC (GFAA):

Graphite Furnace analyses were not used for the samples in this SDG.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was required.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria were met, so no action was taken.

XIII.) Overall Assessment of Data/General:

The non-detect results for antimony, arsenic, copper, lead, thallium and zinc were rejected in all SDG samples because of matrix spike recoveries of less than 30%. All other laboratory data were acceptable with qualifications.

HEXAVALENT CHROMIUM (HexaCr)

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Hexavalent chromium was not detected in the method blanks. No action was necessary.

Deionized Water, Equipment Rinsate and Field Blanks:

Hexavalent chromium was not detected in the three field blanks. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was required.

V.) Duplicate Sample Analysis:

All Duplicate Sample Analysis criteria were met. No action was taken.

VI.) Matrix Spike Recovery (MS):

All MS Recovery criteria were met. No action was required.

VII.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was necessary.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

CHLORIDES

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blanks:

Chlorides were not detected in the method blanks. No action was necessary.

Deionized Water Blank:

Chlorides were detected at 26.0 mg/L in deionized water blank 039DW12I04. The positive detections of chlorides in associated samples 039GW00804, 039GW01204, 039GW12D04 and 039GW12I04, which were less than 5X the blank amount, were flagged as undetected (U) with the detection limit being raised to the amount of contamination in each sample.

Equipment Rinsate and Field Blanks:

Chlorides were detected at 26.0 mg/L and 25.0 mg/L, respectively, in equipment rinsate blank 039EW12I04 and field blank 039FW12I04. The deionized water blank was previously used for blank qualification. No further action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

All Duplicate Sample Analysis criteria were met. No action was taken.

VI.) Matrix Spike Recovery (MS):

All MS Recovery criteria were met. No action was required.

VII.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was necessary.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

SULFATES

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blanks:

Sulfates were not detected in the method blanks. No action was necessary.

Deionized Water, Equipment Rinsate and Field Blanks:

Sulfates were not detected in the three field blanks. No action was required.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

All Duplicate Sample Analysis criteria were met. No action was taken.

VI.) Matrix Spike Recovery (MS):

All MS Recovery criteria were met. No action was required.

VII.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was necessary.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

TOTAL DISSOLVED SOLIDS (TDS)

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blanks:

TDS was not detected in the method blanks. No action was necessary.

Deionized Water Blank:

TDS was detected at 46.0 mg/L in deionized water blank 039DW12I04. The positive detections of TDS in associated samples 039GW00904, 039GW01004, 039GW01104 and 039GW01204, which were less than 5X the blank amount, were flagged as undetected (U) with the detection limit being raised to the amount of contamination in each sample.

Equipment Rinsate and Field Blanks:

TDS was detected at 34.0 mg/L in equipment rinsate blank 039EW12I04 and 24.0 mg/L in field blank 039FW12I04. Since the deionized water blank was previously used for blank qualifications, no further action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

All Duplicate Sample Analysis criteria were met. No action was taken.

VI.) Matrix Spike Recovery (MS):

MS analysis was not required for TDS. No action was required.

VII.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was necessary.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe / Allen & Hoshall
SITE NAME: Charleston Naval Base, Zone A
SERVICE ORDER NUMBER: 0162
CONTRACTED LAB: CEIMIC, Inc.
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3-90 or SW-846
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994; USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994

SAMPLE MATRIX: Water
TYPES OF ANALYSES: Volatile Organics, Total Metals, Cyanide, Hexavalent Chromium (HexaCr), Chlorides, Sulfates, Total Dissolved Solids (TDS)

SDG NUMBER: 6468 (Level III)

SAMPLES:

Client <u>Sample #</u>	Lab <u>Sample #</u>	<u>Matrix</u>	<u>Volatile Organics</u>	<u>Total Metals</u>	<u>Cyanide</u>
GDAGW02D04	6468-02	Water	X	X	X
GDAHW02D04	6468-03	Water	X	X	X
GDATW02D04	6468-03	Water	X		

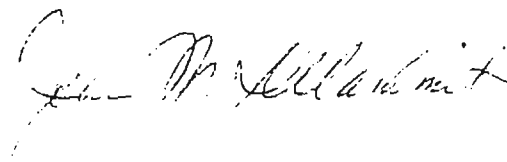
Client <u>Sample #</u>	Lab <u>Sample #</u>	<u>Matrix</u>	<u>HexaCr</u>	<u>Chlorides</u>	<u>Sulfates</u>	<u>TDS</u>
GDAGW02D04	6468-02	Water	X	X	X	X
GDAHW02D04	6468-03	Water	X	X	X	X
GDAHW02D04D	6468-03D	Water	+	+	+	+
GDAHW02D04S	6468-03S	Water	+	+	+	+

Note: Samples GDAGW02D04 and GDAHW02D04 were field duplicates.

D (Suffix) = MATRIX DUPLICATE, S = MATRIX SPIKE, T = TRIP BLANK

DATA REVIEWER(S): Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:

A handwritten signature in cursive script, appearing to read "Jean M. Delashmit". The signature is written in dark ink and is positioned to the right of the "RELEASE SIGNATURE:" label.

Data Qualifier Definitions

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

CEIMIC, Inc. - 6468 CLP Organics and Inorganics

SAMPLES: GDAGW02D04, GDAHW02D04, GDATW02D04, GDAHW02D04D, GDAGW02D04S

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met. No action was taken.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met. No action was necessary.

Continuing Calibration:

The Percent Differences (%D's) for the standards analyzed on 10/24/96 on instrument HP4 exceeded the 25% QC limit for the following compounds:

chloromethane	26.7%
vinyl acetate	43.6%

The non-detect results for these two compounds in the two SDG samples were flagged as estimated (UJ).

IV.) Blanks:

Method Blank:

Acetone was detected at 2.0 ug/L in method blank VBW1024B. Since the positive detection of acetone in associated sample GDAHW02D04 was greater than 10X this amount, no action was taken.

Trip Blank:

There were no positive detections in the trip blank. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was required.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD samples were not analyzed in this fraction of the SDG. No action was taken.

VII.) Laboratory Control Samples (LCS):

One LCS was analyzed in this SDG. All Recovery criteria were met. No action was taken.

VIII.) Field Duplicates:

One set of field duplicate samples, GDAGW02D04 / GDAHW02D04, was analyzed by the laboratory. The Relative Percent Difference (RPD) was 200% for acetone, which exceeded the 30% QC limit for water samples. The positive result for acetone in sample GDAHW02D04 and the non-detect in sample GDAGW02D04 were flagged as estimated (J) and (UJ).

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met. No action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

TOTAL METALS AND CYANIDE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was required.

III.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Max. Conc.</u>	<u>Action Level</u>
CCB3	aluminum	91.9 ug/L	460 ug/L
CCB2	antimony	2.20 ug/L	11.0 ug/L
PBW	barium	0.32 ug/L	1.60 ug/L
CCB3	iron	14.2 ug/L	71.0 ug/L
PBW	magnesium	7.44 ug/L	37.2 ug/L
CCB1	potassium	70.8 ug/L	354 ug/L
PBW	sodium	19.8 ug/L	99.0 ug/L
ICB	thallium	2.80 ug/L	14.0 ug/L
CCB1	vanadium	0.40 ug/L	2.00 ug/L
PBW	zinc	2.70 ug/L	13.5 ug/L

CCB = Continuing Calibration Blank, ICB = Initial Calibration Blank,
PBW = Preparation Blank (Water)

All associated positive sample results were greater than 5X the blank amounts, so no action was required.

The following analytes had negative results with absolute values greater than the IDL:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Neg. Conc.</u>	<u>5X Conc.</u>
CCB3	beryllium	-0.40 ug/L	2.00 ug/L
CCB3	calcium	-41.2 ug/L	206 ug/L
CCB3	chromium	-3.20 ug/L	16.0 ug/L
CCB3	cobalt	-2.60 ug/L	13.0 ug/L
CCB3	copper	-2.90 ug/L	14.0 ug/L
CCB3	nickel	-1.90 ug/L	9.50 ug/L
CCB3	silver	-3.00 ug/L	15.0 ug/L
CCB2	zinc	-4.40 ug/L	22.0 ug/L

CCB = Continuing Calibration Blank

All associated positive sample results less than 5X the absolute value of the negative blank results and all associated non-detects were flagged as estimated (J) and (UJ).

IV.) ICP Interference Check Sample Results:

All Percent Recovery criteria were met, so no action was taken.

The following analytes were detected in ICS Solution A at concentrations greater than the IDL:

antimony	3 ug/L
arsenic	2 ug/L
manganese	5 ug/L
potassium	63 ug/L
selenium	8 ug/L
thallium	11 ug/L

These analytes should not be present. Since magnesium was present in the samples at a concentration comparable to the amount in Solution A, all positive detections of these analytes in the two associated samples were flagged as estimated (J).

Negative results were observed in ICS Solution A at absolute concentrations greater than the IDL for the following analytes:

barium	-5 ug/L
chromium	-10 ug/L
cobalt	-5 ug/L
copper	-9 ug/L
lead	-2 ug/L
nickel	-12 ug/L
silver	-7 ug/L
sodium	-245 ug/L
vanadium	-1 ug/L

These analytes should not be present. Since magnesium was present in the samples at a concentration comparable to the amount in Solution A, all non-detect results for these analytes in the two associated samples were flagged as estimated (UJ).

V.) ICP Serial Dilution Analysis:

The ICP Serial Dilution Analysis Percent Differences (%D's) for magnesium (11.1%) and potassium (38.8%) exceeded the 10% QC limit for dilution sample GDAGW02D04L. The positive results for these analytes in the two associated samples were flagged as estimated (J).

VI.) Laboratory Control Samples (LCS):

All LCS Recovery criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this fraction of the SDG. No action was necessary.

VIII.) Spike Recovery:

Matrix Spike analysis was not performed in this fraction of the SDG. No action was taken.

IX.) Field Duplicates:

One set of field duplicate samples, GDAGW02D04 / GDAHW02D04, was analyzed by the laboratory. The calculable Relative Percent Differences (RPD's) were:

<u>Analyte</u>	<u>GDAGW02D04</u>	<u>GDAHW02D04</u>	<u>RPD</u>
calcium	192000 ug/L	196000 ug/L	2.1%
iron	21300 ug/L	2190 ug/L	2.8%
magnesium	479000 ug/L	490000 ug/L	2.3%
manganese	2600 ug/L	2720 ug/L	4.5%
potassium	261000 ug/L	272000 ug/L	4.1%
sodium	3580000 ug/L	39500000 ug/L	9.8%

Since all RPD's were within the 30% QC limit for water samples, no action was necessary.

X.) Graphite Furnace Atomic Absorption QC (GFAA):

Graphite Furnace analyses were not used for the samples in this SDG. No action was required.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was required.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria were met, so no action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

HEXA VALENT CHROMIUM (HexaCr)

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Hexavalent chromium was not detected in the method blanks. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met. No action was required.

V.) Duplicate Sample Analysis:

All Duplicate Sample Analysis criteria were met. No action was taken.

VI.) Matrix Spike Recovery (MS):

All MS Recovery criteria were met. No action was required.

VII.) Field Duplicates:

One set of field duplicate samples, GDAGW02D04 / GDAHW02D04, was analyzed by the laboratory. The Relative Percent Difference for hexavalent chromium in the two samples was not calculable. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

CHLORIDES

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Chlorides were not detected in method blanks. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

All Duplicate Sample Analysis criteria were met. No action was taken.

VI.) Matrix Spike Recovery (MS):

All MS Recovery criteria were met. No action was required.

VII.) Field Duplicates:

One set of field duplicate samples, GDAGW02D04 / GDAHW02D04, was analyzed by the laboratory. The Relative Percent Difference (RPD) for chlorides was 199%, which exceeded the 30% QC limit for water samples. The positive detections of chlorides in the two samples were flagged as estimated (J).

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

SULFATES

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Sulfates were not detected in the method blanks. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

All Duplicate Sample Analysis criteria were met. No action was taken.

VI.) Matrix Spike Recovery (MS):

All MS Recovery criteria were met. No action was required.

VII.) Field Duplicates:

One set of field duplicate samples, GDAGW02D04 / GDAHW02D04, was analyzed by the laboratory.

The Relative Percent Difference (RPD) for sulfates in the two samples was not calculable. No action was necessary.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

TOTAL DISSOLVED SOLIDS (TDS)

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

TDS was not detected in the method blanks. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

All Duplicate Sample Analysis criteria were met. No action was taken.

VI.) Matrix Spike Recovery (MS):

All MS Recovery criteria were met. No action was required.

VII.) Field Duplicates:

One set of field duplicate samples, GDAGW02D04 / GDAHW02D04, was analyzed by the laboratory. The Relative Percent Difference (RPD) for TDS was 180%, which exceeded the 30% QC limit for water samples. The positive detections of TDS in the two samples were flagged as estimated (J).

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

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(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe / Allen & Hoshall
SITE NAME: Charleston Naval Base, Zone A
SERVICE ORDER NUMBER: 0161
CONTRACTED LAB: CEIMIC, Inc.
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3-90 or SW-846
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994
SAMPLE MATRIX: Water
TYPES OF ANALYSES: Volatile Organics, Semivolatile Organics
SDG NUMBER: 6589 (Level III)

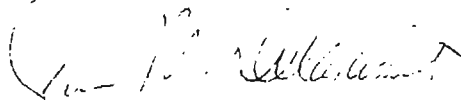
SAMPLES:

Client Sample #	Lab Sample #	Matrix	Volatile Organics	Semi- volatiles
039GW04I01	6607-07	Water	X	X
039GW09D01	6589-04	Water	X	X
039GW09I01	6607-01	Water	X	X
039GW10D01	6607-06	Water	X	X
039GW10I01	6607-05	Water	X	X
039GW10I01DL	6607-05DL	Water	+	
039GW13D01	6607-02	Water	X	X
039GW13I01	6607-03	Water	X	X
039GW13I01RE	6607-03RE	Water		+
039DW09D01	6589-02	Water	X	X
039EW09D01	6589-01	Water	X	X
039FW09D01	6589-02	Water	X	X
039TW04I01	6607-08	Water	X	
039TW09D01	6589-05	Water	X	
039TW09I01	6607-04	Water	X	
039GW13I01MS	6607-03MS	Water	+	
039GW13I01MSD	6607-03MSD	Water	+	
039EW09D01MS	6589-01MS	Water	+	
039EW09D01MSD	6589-01MSD	Water	+	

DL = DILUTION, DW = DEIONIZED WATER BLANK, EW = EQUIPMENT RINSATE BLANK,
FW = FIELD BLANK, MS = MATRIX SPIKE, MSD = MATRIX SPIKE DUPLICATE,
RE = REANALYSIS, TW = TRIP BLANK

DATA REVIEWER(S): Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:

A handwritten signature in black ink, appearing to read "Marvin L. Smith", written over a horizontal line.

Data Qualifier Definitions

- J - The association numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

CEIMIC, Inc. - 6589 CLP Organics

SAMPLES: 039GW04I01, 039GW09D01, 039GW09I01, 039GW10D01, 039GW10I01,
039GW10I01DL, 039GW13D01, 039GW13I01, 039GW13I01RE, 039DW09D01,
039EW09D01, 039FW09D01, 039TW04I01, 039TW09D01, 039TW09I01,
039GW13I01MS, 039GW13I01MSD, 039EW09D01MS, 039EW09D01MSD

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met. No action was taken.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met. No action was necessary.

Continuing Calibration:

All Continuing Calibration criteria were met. No action was taken.

IV.) Blanks:

Method Blank:

There were no positive detections in the method blanks. No action was required.

Deionized Water, Equipment Rinsate and Field Blanks:

Chloroform was detected at 4 ug/L, 4 ug/L and 3 ug/L, respectively, in deionized water blank 039DW09D01, equipment rinsate blank 039EW09D01 and field blank 039FW09D01. Since there were no positive detections of chloroform in the associated samples, no action was necessary.

Trip Blanks:

There were no positive detections in trip blank 039TW04I01. No action was taken.

Chloroform (98 ug/L), bromodichloromethane (25 ug/L), dibromochloromethane (7 ug/L) and total xylene (3 ug/L) were detected in trip blank 039TW09D01. In addition, chloroform (96 ug/L), bromodichloromethane (25 ug/L) and dibromochloromethane (8 ug/L) were detected in trip blank 039TW09I01. There were no positive detections of these compounds in the associated samples. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was required.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

All MS / MSD criteria were met for the two sets of spiked QC samples. No action was necessary.

VII.) Laboratory Control Samples (LCS):

Three LCS's were analyzed in this SDG. All Recovery criteria were met. No action was taken.

VIII.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was required.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

The concentration of acetone (390 ug/L) exceeded the standard calibration range in sample 039GW10I01. The original sample result for acetone was replaced on the spreadsheets by the validator with the dilution sample (039GW10I01DL) result with the appropriate flag (D).

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

SEMIVOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met. No action was necessary.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 11/12/96 at 15:10 on instrument HP7 for the following compounds:

benzoic acid	29.7%
3-nitroaniline	27.9%
2,4-dinitrophenol	45.1%
3,3'-dichlorobenzidine	54.7%

The non-detect results for these compounds in the associated samples were flagged as estimated (UJ). The associated samples were 039GW04I01, 039GW09D01, 039GW09I01, 039GW10D01, 039GW10I01 and 039GW13D01.

The Percent Difference (%D) for 3,3'-dichlorobenzidine was 26.6% for the standard analyzed on 11/14/96 at 13:52 on instrument HP7, which exceeded the 25% QC limit. The non-detect result for this compound in associated sample 039GW13I01RE was flagged as estimated (UJ).

IV.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was required.

Deionized Water, Equipment Rinsate and Field Blanks:

There were no positive detections in the three field blanks in this SDG. No action was required.

TIC's:

4-Hydroxy-4-methyl-2-pentanone was detected at 40 ug/L in method blank EBW1107 and 12 ug/L in equipment rinsate blank 039EW09D01. The concentrations were sufficient to qualify the positive

result for this compound in sample 039GW09D01 as undetected. TIC's were not reported on the spreadsheets.

V.) Surrogate Recoveries:

The Percent Recoveries (%R's) of surrogate compound phenol-d6 in associated samples 039GW04I01 (96%), 039GW09D01 (97%) and 039GW13D01 (99%) exceeded the 10-94% QC limits. Since only one surrogate was outside QC limits in the base/neutral fraction of each sample, no action was required.

The Percent Recoveries (%R's) were below the 10% rejection limit in sample 039GW10I01 for the following surrogates:

<u>Surrogate</u>	<u>%R</u>	<u>QC Limits</u>
phenol-d6	6	10-94%
2-fluorophenol	4	21-100%
2,4,6-tribromophenol	8	10-123%
2-chlorophenol-d4	9	33-110%

All compounds in the acid fraction of this sample, which consisted entirely of non-detects, were rejected (R). This sample was not reanalyzed.

All four acid fraction surrogates were below the 10% rejection limit in sample 039GW13I01. All Surrogate Recovery criteria were met for reanalysis sample 039GW13I01RE.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD analyses were not performed in this fraction of the SDG. No action was taken.

VII.) Laboratory Control Samples (LCS):

Four LCS's were analyzed in this SDG. Several Percent Recoveries exceeded the QC limits. Data validation action based on LCS criteria was not required. No action was taken.

VIII.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was required.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met. Refer to Section IV for blank qualification.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

The reanalysis of sample 039GW13I01 was considered by the validator to be of preferable data quality to the original analysis because of improved Surrogate Recoveries.

All non-detect acid fraction compounds in sample 039GW10I01 were rejected because of very low (less than 10%) surrogate recoveries. All other laboratory data were acceptable with qualifications.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
SERVICE ORDER NUMBER: 0225
CONTRACTED LAB: Ceimic Corporation
QA/QC LEVELS: EPA Level III / Level IV
EPA METHODS: EPA SOW 3-90 / SW846
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994; USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994

SAMPLE MATRIX: Water
TYPES OF ANALYSES: Volatile Organics, Semivolatile Organics, Pesticides/PCB's, Total Metals, Cyanide, Alkalinity, Ammonia. Biological Oxygen Demand (BOD), Chlorides, Ferrus Iron, Nitrate-Nitrogen, Nitrite-Nitrogen, Total Phosphorus, Sulfates, Sulfides

SDG NUMBERS: 7438A (Appendix IX, Level IV)
7438B (Level III)

SAMPLES:

SDG 7438A (Level IV):

Client Sample #	Lab Sample #	Matrix	Volatile Organics	Semi- volatiles	Pesticides/ PCB's	Total Metals	Cyanide
039DW014A2	7438-04	Water	X	X	X	X	X
039EW014A2	7438-05	Water	X	X	X	X	X
039FW014A2	7438-06	Water	X	X	X	X	X

D = DEIONIZED WATER BLANK, E = EQUIPMENT RINSATE BLANK, F = FIELD BLANK

SDG 7438B (Level III):

Client Sample #	Lab Sample #	Matrix	Volatile Organics	Semi- volatiles	Pesticides/ PCB's	Total Metals	Cyanide
039GW014A2	7438-03	Water	X	+	X	X	X
039GW014A2RE	7438-03RE	Water		X			

Client	Lab		Volatile	Semi-	Pesticides/	Total	
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Organics</u>	<u>volatiles</u>	<u>PCB's</u>	<u>Metals</u>	<u>Cyanide</u>
039GW015A2	7438-01	Water	X	X	X	X	X
039GW015DA	7438-02	Water	X	X	X	X	X
039GW14DA2	7446-02	Water	X	X	X	X	X
043GW001A2	7446-01	Water	X	X	X	X	X
039TW014A2	7438-07	Water	X				
039TW14DA2	7446-03	Water	X				

Client	Lab					Ferrus	
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Alkalinity</u>	<u>Ammonia</u>	<u>BOD</u>	<u>Chlorides</u>	<u>Iron</u>
039GW014A2	7438-03	Water	X	X	X	X	X
039GW015A2	7438-01	Water	X	X	X	X	X
039GW015DA	7438-02	Water	X	X	X	X	X
039GW14DA2	7446-02	Water	X	X	X	X	X
043GW001A2	7446-01	Water	X	X	X	X	X
039GW015A2MD	7438-01MD	Water	+	+	+	+	+
039GW14DA2MD	7446-02MD	Water			+		
039GW014A2MS	7438-03MS	Water		+		+	
039GW015DAMS	7438-02MS	Water					+

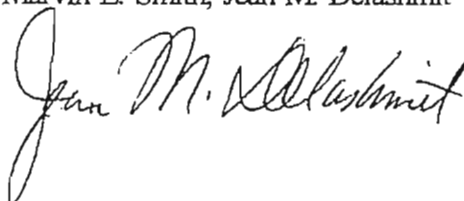
Client	Lab		Nitrate-	Nitrite-	Total		
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Nitrogen</u>	<u>Nitrogen</u>	<u>Phosphorus</u>	<u>Sulfates</u>	<u>Sulfides</u>
039GW014A2	7438-03	Water	X	X	X	X	X
039GW015A2	7438-01	Water	X	X	X	X	X
039GW015DA	7438-02	Water	X	X	X	X	X
039GW14DA2	7446-02	Water	X	X	X	X	X
043GW001A2	7446-01	Water	X	X	X	X	X
039GW015A2MD	7438-01MD	Water	+	+	+	+	+
039GW14DA2MD	7446-02MD	Water	+	+			
039GW015DAMS	7438-02MS	Water	+	+	+	+	+
039GW14DA2MS	7446-02MS	Water	+	+			

+ = Non-billable analysis

MD = MATRIX DUPLICATE, MS = MATRIX SPIKE, RE = REANALYSIS, T = TRIP BLANK

DATA REVIEWER(S): Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Ceimic Corporation - 7438A Appendix IX, CLP Organic and Inorganics

SAMPLES: 039DW014A2, 039EW014A2, 039FW014A2

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

The average Relative Response Factors (RRF's) for the standards analyzed on 4/1/97 on instrument HP2 were below the 0.050 QC limit for the following compounds:

acrolein	0.010
acrylonitrile	0.032
propionitrile	0.012
acetonitrile	0.017
isobutyl alcohol	0.010
1,4-dioxane	0.005

The non-detect results for these compounds in the three field blank samples were rejected (R).

Continuing Calibration:

No continuing calibration analysis was performed in this SDG. Calibration was based solely on the initial calibration. No action was required.

IV.) Blanks:

Method Blank:

There were no positive detections for the method blank. No action was required.

Trip Blank:

Acetone and bromodichloromethane were detected at 15 ug/L and 2 ug/L, respectively, in trip blank 039TW014A2, which was analyzed in SDG 7438B. Since the three associated samples were field blanks, no action was necessary.

Tentatively Identified Compounds (TIC):

TIC's were not detected in the method, field or trip blanks. No action was taken.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Laboratory Control Samples (LCS):

One LCS was analyzed by the laboratory. All LCS Recovery criteria were met. No action was necessary.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

There were no MS / MSD analyses in this SDG. No action was taken.

VIII.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was necessary.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

The non-detect results for acrolein, acrylonitrile, propionitrile, acetonitrile, isobutyl alcohol and 1,4-dioxane in the three field blank samples were rejected because of low RRF's in the initial calibration. All other laboratory data were acceptable without qualification.

SEMIVOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was necessary.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was taken.

III.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was necessary.

IV.) Blanks:

Method Blank:

There were no positive detections in the method blank. No action was required.

Tentatively Identified Compounds (TIC):

TIC's were not detected in the method or field blanks. No action was taken.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was necessary.

VI.) Laboratory Control Samples (LCS):

Two LCS's were analyzed by the laboratory. Three Percent Recoveries exceeded the QC limits. Data validation action based on LCS Recovery criteria was not required. No action was taken.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

There were no MS / MSD analyses for this SDG. No action was taken.

VIII.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was required.

IX.) Internal Standards Performance:

All Internal Standards Performance criteria were met, so no action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was required.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was taken.

XII.) Tentatively Identified Compounds (TIC's):

All TIC criteria were met, so no action was necessary.

XIII.) System Performance:

All System Performance criteria were met, so no action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

PESTICIDES/PCB's

I.) Holding Times:

All Holding Time criteria were met, so no action was required.

II.) Instrument Performance:

All Pesticide Instrument Performance criteria were met, so no action was taken.

III.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

IV.) Blanks:

Method Blank:

There were no positive detections in the method blank. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was taken.

VI.) Laboratory Control Sample (LCS):

One LCS was analyzed by the laboratory. All LCS Percent Recovery criteria were met. No action was necessary.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

There were no MS / MSD analyses in this SDG. No action was taken.

VIII.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was necessary.

IX.) TCL Compound Identification:

Pesticide/PCB Identification Summary (PIS):

All PIS Identification criteria were met. No action was required.

X.) Pesticide Cleanup Check:

Florisil Cartridge Check:

All criteria were met, so no action was taken.

Gel Permeation Chromatography (GPC):

GPC cleanup was not required for this SDG. No action was necessary.

XI.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

TOTAL METALS AND CYANIDE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was necessary.

III.) Blanks:

Blank qualification for this fraction of the SDG was not required since the three samples were field blanks. No action was taken.

IV.) ICP Interference Check Sample Results:

All ICP Interference Check Sample criteria were met. No action was required.

V.) ICP Serial Dilution Analysis:

All ICP Serial Dilution criteria were met. No action was taken.

VI.) Laboratory Control Samples (LCS):

All LCS Recovery criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was necessary.

VIII.) Matrix Spike Recoveries (MS):

No MS sample was analyzed in this SDG. No action was taken.

IX.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was taken.

X.) Graphite Furnace Atomic Absorption QC (GFAA):

Graphite Furnace analyses were not used for the samples in this SDG. No action was required.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met, so no action was necessary.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria were met, so no action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

DATA QUALIFICATION SUMMARY

Ceimic Corporation - 7438B Level III, CLP Organics and Inorganics

SAMPLES: 039GW014A2, 039GW014A2RE, 039GW015A2, 039GW015DA, 039GW14DA2,
043GW001A2, 039TW014A2, 039TW14DA2, 039GW015A2MD, 039GW14DA2MD,
039GW014A2MS, 039GW015DAMS, 039GW14DA2MS

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was required.

III.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was taken.

IV.) Blanks:

Method Blank:

There were no positive detections in the method blank. No action was taken.

Deionized Water Blank:

Acetone and 2-butanone were detected at 6 ug/L and 3 ug/L, respectively, in deionized water blank 039DW014A2, which was analyzed in SDG 7438A. There were no detections of these two compounds in the associated samples. No action was required.

Equipment Rinsate Blank:

Acetone was detected at 5 ug/L in equipment rinsate blank 039EW014A2, which was analyzed in SDG 7438A. Acetone was not detected in the associated samples. No action was necessary.

Field Blank:

Chloroform was detected at 2 ug/L in field blank 039FW014A2, which was analyzed in SDG 7438A. Chloroform was not detected in the associated samples. No action was taken.

Trip Blanks:

Acetone was detected at 15 ug/L each in trip blanks 039TW0014A2 and 039TW14DA2. Acetone was not detected in the associated samples. No action was required.

Bromodichloromethane was detected at 2 ug/L each in trip blanks 039TW014A2 and 039TW14DA2. Detections of this compound in associated samples 039GW015A2, 039GW015DA, 039GW14DA2 and 043GW001A2, which were less than 5X the blank amounts, were flagged as undetected (U) with the analytical results below the CRQL being raised to the CRQL.

Tentatively Identified Compounds (TIC):

TIC's were not detected in the method, field and trip blanks. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was required.

VI.) Laboratory Control Samples (LCS):

One LCS was analyzed by the laboratory. All LCS Recovery criteria were met. No action was taken.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD samples were not analyzed in this fraction of the SDG. No action was necessary.

VIII.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was taken.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

SEMIVOLATILE ORGANICS

I.) Holding Times:

The holding time from sample date to reextraction date was 14 days for sample 039GW014A2RE, which exceeded the 7 day QC limit. All positive and non-detect results for this sample were flagged as estimated (J) and (UJ).

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was taken.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met. No action was necessary.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 4/8/97 at 10:10 on instrument HP1 for the following compounds:

4-nitroaniline	34.3%
3,3'-dichlorobenzidine	39.6%

The non-detect results for these two compounds in associated sample 039GW014A2RE were previously qualified based on Holding Time criteria. No further action was taken.

IV.) Blanks:

Method Blanks:

There were no detections in the method blanks. No action was required.

Field Blanks:

There were no detections in the three field blanks, which were analyzed in SDG 7438A. No action was necessary.

Tentatively Identified Compounds (TIC):

TIC's were not detected in the method or field blanks. No action was taken.

V.) Surrogate Recoveries:

Three base/neutral surrogate recoveries were below 10% in the original analysis of sample 039GW014A2. All criteria were met for the reanalysis of this sample. All other Surrogate Recovery criteria were met. No action was required.

VI.) Laboratory Control Samples (LCS):

Four LCS's were analyzed by the laboratory. Three Percent Recoveries exceeded the QC limits. Data validation action based on LCS Recovery criteria was not required. No action was necessary.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD samples were not analyzed in this SDG, so no action was taken.

VIII.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was required.

IX.) Internal Standards Performance:

All Internal Standards Performance criteria were met, so no action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was required.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was taken.

XII.) Tentatively Identified Compounds (TIC's):

All TIC criteria were met, so no action was necessary.

XIII.) System Performance:

All System Performance criteria were met, so no action was taken.

XIV.) Overall Assessment of Data/General:

The reanalysis of sample 039GW014A2 was considered by the validator to be of preferable data quality to the original analysis due to improved surrogate recoveries. All laboratory data were acceptable with qualifications.

PESTICIDES/PCB's

I.) Holding Times:

All Holding Time criteria were met, so no action was required.

II.) Instrument Performance:

All Pesticide Instrument Performance criteria were met, so no action was taken.

III.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was necessary.

IV.) Blanks:

Method Blank:

There were no detections in the method blank. No action was required.

Field Blanks:

There were no detections in the three field blanks, which were analyzed in SDG 7438A. No action was taken.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was required.

VI.) Laboratory Control Sample (LCS):

One LCS was analyzed by the laboratory. All LCS Recovery criteria were met. No action was taken.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD samples were not analyzed in this fraction of the SDG. No action was taken.

VIII.) TCL Compound Identification:

Pesticide/PCB Identification Summary (PIS):

All PIS Identification criteria were met. No action was required.

IX.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was necessary.

X.) Pesticide Cleanup Check:

Florisil Cartridge Check:

All criteria were met, so no action was taken.

Gel Permeation Chromatography (GPC):

GPC cleanup was not required for this SDG. No action was necessary.

XI.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

TOTAL METALS AND CYANIDE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was necessary.

III.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

<u>Blank ID</u>	<u>Analyte</u>	<u>Max. Conc.</u>	<u>Action Level</u>
PBW	aluminum	38.8 ug/L	194 ug/L
PBW	antimony	2.57 ug/L	12.9 ug/L
ICB	arsenic	2.80 ug/L	14.0 ug/L
ICB	beryllium	0.30 ug/L	1.50 ug/L
DWB	chromium	6.20 ug/L	31.0 ug/L
DWB	lead	1.30 ug/L	6.50 ug/L
CCB4	magnesium	8.30 ug/L	41.5 ug/L
CCB5	silver	1.20 ug/L	6.00 ug/L
CCB2	sodium	59.3 ug/L	297 ug/L
DWB	zinc	13.5 ug/L	67.5 ug/L

CCB = Continuing Calibration Blank, DWB = Deionized Water Blank (analyzed in SDG 7438A), ICB = Initial Calibration Blanks, PBW = Preparation Blank (Water)

All results greater than the IDL but less than 5X the blank amount (Action Level, ug/L for water samples) for which the contaminated blank was an associated calibration, deionized water or preparation blank were flagged as undetected (U).

The following analytes had negative results with absolute values greater than the IDL:

<u>Blank ID</u>	<u>Analyte</u>	<u>Neg. Conc.</u>	<u>5X Conc.</u>
CCB3	chromium	-3.20 ug/L	16.0 ug/L
PBW	sodium	-11.0 ug/L	55.0 ug/L
PBW	zinc	-1.37 ug/L	6.85 ug/L

CCB = Continuing Calibration Blank, PBW = Preparation Blank (Water)

All associated positive sample results after blank qualification were greater than 5X the absolute value of the negative blank results. All associated non-detects were flagged as estimated (UJ).

IV.) ICP Interference Check Sample Results:

All Percent Recovery criteria were met, so no action was taken.

The following analytes were detected in ICS Solution A at concentrations greater than the IDL:

antimony	3 ug/L
arsenic	7 ug/L
cadmium	2 ug/L
lead	3 ug/L
manganese	10 ug/L
tin	293 ug/L
vanadium	1 ug/L
zinc	12 ug/L

These analytes should not be present. Since neither aluminum, calcium, iron nor magnesium was detected at a concentration comparable to or greater than that of ICS Solution A, no action was taken.

Negative results were observed in ICS Solution A at absolute concentrations greater than the IDL for the following analytes:

barium	-2 ug/L
chromium	-5 ug/L
cobalt	-5 ug/L
nickel	-5 ug/L
potassium	-107 ug/L
selenium	-10 ug/L
silver	-4 ug/L

Since neither aluminum, calcium, iron nor magnesium was detected at a concentration comparable to or greater than that of ICS Solution A, no action was taken.

V.) ICP Serial Dilution Analysis:

The Serial Dilution Percent Differences (%D's) for potassium were 30.0% and 26.1%, respectively, for dilution samples 039GW015A2L and 043GW001A2L, which exceeded the 10% QC limits. The

detections of potassium in all SDG samples were flagged as estimated (J).

VI.) Laboratory Control Samples (LCS):

All LCS Recovery criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this fraction of the SDG. No action was taken.

VIII.) Matrix Spike Recoveries (MS):

MS samples were not analyzed in this fraction of the SDG. No action was taken.

IX.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was required.

X.) Graphite Furnace Atomic Absorption QC (GFAA):

Graphite Furnace analyses were not used for the samples in this SDG. No action was required.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met, so no action was necessary.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria were met, so no action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

ALKALINITY

I.) Holding Times:

All Holding Time criteria were met. No action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was necessary.

III.) Blanks:

There were no positive detections in the method blanks. No action was required.

IV.) Laboratory Control Sample (LCS):

All LCS Recovery criteria were met. No action was taken.

V.) Duplicate Sample Analysis:

All Duplicate Sample Analysis criteria were met. No action was required.

VI.) Matrix Spike Recovery (MS):

MS samples were not analyzed in this fraction of the SDG. No action was necessary.

VII.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was required.

VIII.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was taken.

IX.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

AMMONIA

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was necessary.

III.) Blanks:

Ammonia was not detected in the method blanks. Data qualification was not necessary.

IV.) Laboratory Control Sample (LCS):

All LCS Recovery criteria were met. No action was required.

V.) Duplicate Sample Analysis:

All Duplicate Sample Analysis criteria were met. No action was required.

VI.) Matrix Spike Recovery (MS):

All MS Recovery criteria were met. No action was taken.

VII.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was required.

VIII.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was taken.

IX.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

BIOLOGICAL OXYGEN DEMAND (BOD)

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was necessary.

III.) Blanks:

BOD was not detected in the method blanks. Data qualification was not necessary.

IV.) Laboratory Control Sample (LCS):

All LCS Recovery criteria were met. No action was required.

V.) Duplicate Sample Analysis:

All Duplicate Sample Analysis criteria were met. No action was required.

VI.) Matrix Spike Recovery (MS):

All MS Recovery criteria were met. No action was taken.

VII.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was required.

VIII.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was taken.

IX.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

CHLORIDES

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Chlorides were not detected in the method blanks. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

All Duplicate Sample Analysis criteria were met. No action was required.

VI.) Matrix Spike Recovery (MS):

All MS Recovery criteria were met. No action was taken.

VII.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was required.

VIII.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was taken.

IX.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

FERRUS IRON

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

There was no detections in the method blanks. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

All Duplicate Sample Analysis criteria were met. No action was required.

VI.) Matrix Spike Recovery (MS):

All MS Recovery criteria were met. No action was taken.

VII.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was required.

VIII.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was taken.

IX.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

NITRATE-NITROGEN

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

There was no detection in the method blanks. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

All Duplicate Sample Analysis criteria were met. No action was required.

VI.) Matrix Spike Recovery (MS):

All MS Recovery criteria were met. No action was taken.

VII.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was required.

VIII.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was taken.

IX.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

NITRITE-NITROGEN

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

There was no detections in the method blanks. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

All Duplicate Sample Analysis criteria were met. No action was required.

VI.) Matrix Spike Recovery (MS):

All MS Recovery criteria were met. No action was taken.

VII.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was required.

VIII.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was taken.

IX.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

TOTAL PHOSPHORUS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

There was no detection in the method blanks. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

All Duplicate Sample Analysis criteria were met. No action was required.

VI.) Matrix Spike Recovery (MS):

All MS Recovery criteria were met. No action was taken.

VII.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was required.

VIII.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was taken.

IX.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

SULFATES

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

There were no sulfate detections in the method blanks. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

All Duplicate Sample Analysis criteria were met. No action was taken.

VI.) Matrix Spike Recovery (MS):

All MS Recovery criteria were met. No action was taken.

VII.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was required.

VIII.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was taken.

IX.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

SULFIDES

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Sulfides were not detected in the method blanks. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

All Duplicate Sample Analysis criteria were met. No action was taken.

VI.) Matrix Spike Recovery (MS):

All MS Recovery criteria were met. No action was taken.

VII.) Field Duplicates:

Field duplicate samples were not analyzed in this SDG. No action was required.

VIII.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was taken.

IX.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

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DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
PROJECT NUMBER: 8500.14
CONTRACTED LAB: Lockheed Analytical Services
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3/90
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994
SAMPLE MATRIX: Water
TYPES OF ANALYSES: Pesticides/PCB's, Total Metals
SDG NUMBER: L6884 (Level III)

SAMPLES:

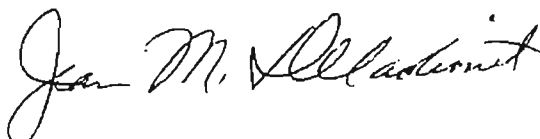
Client	Lab		Pesticides/	Total
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>PCB's</u>	<u>Metals</u>
038GW00102	L6884-1/7	Water	X	X
038GW00102DL	L6884-1DL	Water	X	
038GW00202	L6884-3/8	Water	X	X
002GW00102	L6884-5	Water		X
002GW00202	L6884-6	Water		X
002GW00102MS	L6884WMS	Water		+
002GW00102MSD	L6884WMSD	Water		+

+ = Non-billable Quality Control Sample

DL = DILUTION, MS = MATRIX SPIKE, MSD = MATRIX SPIKE DUPLICATE

DATA REVIEWER(S): Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions:

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.
- N - The compound/analyte is presumably present.
- NJ - The compound/analyte is presumably present at an estimated quantity.

DATA QUALIFICATION SUMMARY

Lockheed Analytical Services - L6884 Level IV, CLP Organics and Inorganics

SAMPLES: 038GW00102, 038GW00102DL, 038GW00202, 002GW00102, 002GW00202,
002GW00102MS, 002GW00102MSD

PESTICIDES/PCB's

I.) Holding Times:

All Holding Time criteria were met, so no action was required.

II.) Instrument Performance:

All Pesticide Instrument Performance criteria were met, so no action was taken.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met, so no action was necessary.

Continuing Calibration:

The Percent Differences (%D's) for beta-BHC and endosulfan sulfate were 33.1% and 26.6%, respectively, for the standards analyzed on the primary column on 5/15/96 at 07:01, which exceeded the 25% QC limit. The non-detect results for these two compounds in associated sample 038GW00102DL were flagged as estimated (UJ).

IV.) Blanks:

Method Blank:

There were no positive detections in the method blank. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was taken.

VI.) Laboratory Control Samples (LCS):

Three LCS's were analyzed with this SDG. All Percent Recovery criteria were met. No action was taken.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD samples were not analyzed in this fraction. No action was taken.

VIII.) TCL Compound Identification:

Pesticide/PCB Identification Summary (PIS):

All PIS Identification criteria were met. No action was required.

IX.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was required.

X.) Pesticide Cleanup Check:

Florisil Cartridge Check:

All criteria were met, so no action was taken.

Gel Permeation Chromatography (GPC):

GPC cleanup was not required for water samples. No action was necessary.

XI.) Overall Assessment of Data/General:

The result for 4,4'-DDD in sample 038GW00102 was above the instrument's linear range. The original value for this compound was replaced with the diluted value with the appropriate flagging. All laboratory data were acceptable with qualifications.

TOTAL METALS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was necessary.

III.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for blank qualification:

Blank Type/ID#	Analyte	Max Conc., ug/L	Action Level, ug/L
ERB	aluminum	102	510
CCB1	antimony	4.00	20.0
ERB	arsenic	3.10	15.5
DWB	barium	146	730
DWB	calcium	4880	24400
ERB	iron	47.3	237
FB	magnesium	530	2650
ERB	manganese	7.60	38.0
DWB	nickel	14.5	72.5
DWB	sodium	28200	141000
ERB	zinc	21.6	108

CCB = Continuing Calibration Blank, DWB = Deionized Water Blank (002DW00202),
ERB = Equipment Rinsate Blank (002EW00202), FB = Field Blank (002FW00202)

The deionized water, equipment rinsate and field blanks were analyzed in SDG L6894. All sample results greater than the IDL but less than 5X the blank amount (Action Level, ug/L for water samples) for which the contaminated blank was an associated calibration, deionized water, equipment rinsate or field blank were flagged as undetected (U).

Negative results were observed for aluminum (-44.9 ug/L) in CCB5 and potassium (-1370 ug/L) in CCB3 with absolute values greater than the IDL. All associated positive sample results less than 5X the absolute value of the negative blank results and all associated non-detects were flagged as estimated (J) and (UJ).

IV.) ICP Interference Check Sample Results:

All Percent Recovery criteria were met, so no action was taken.

The following analytes were present in ICS Solution A at concentrations greater than the IDL:

cadmium	9 ug/L
manganese	4 ug/L

These analytes should not be present. Since neither aluminum, calcium, iron nor magnesium was present in the associated samples at a concentration comparable to or greater than the amount in Solution A, no action was necessary.

Negative results were observed in Solution A for the following analytes:

cobalt	-9 ug/L
sodium	-154 ug/L
potassium	-1550 ug/L

Since neither aluminum, calcium, iron nor magnesium was present in the associated samples at a concentration comparable to or greater than the amount in Solution A, no action was taken.

V.) ICP Serial Dilution Analysis:

All Serial Dilution Analysis criteria were met. No action was necessary.

VI.) Laboratory Control Samples (LCS):

All LCS Recovery criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

There were no Duplicate Sample Analyses performed in this SDG. Instead, MS / MSD samples were prepared and analyzed. No action was taken.

VIII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

The Relative Percent Difference (RPD) was 22.2% for thallium in spiked samples 002GW00102MS and 002GW00102MSD, which exceeded the 20% QC limit for water samples. The non-detect results for thallium in all SDG samples were flagged as estimated (UJ).

The Percent Recoveries (%R's) of selenium were 68.0% in both spiked samples 002GW00102MS and 002GW00102MSD, which were below the 75-125% QC limits. The non-detect results for selenium in all SDG samples were flagged as estimated (UJ). The %R of thallium was 63.2% in spiked sample 002GW00102MS, which was below the 75-125% QC limits. Thallium was previously qualified based on a high RPD. No further action was necessary.

IX.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was taken.

X.) Graphite Furnace Atomic Absorption QC (GFAA):

All Graphite Furnace criteria were met. No action was required.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was necessary.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria were met, so no action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

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Chemical Services, Inc.

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DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Naval Base, Zone A
PROJECT NUMBER: 8500.14
CONTRACTED LAB: Lockheed Analytical Services
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3/90
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994; USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994
SAMPLE MATRIX: Water
TYPES OF ANALYSES: Volatile Organics, Semivolatile Organics, Pesticides/PCB's, Total Metals, Hexavalent Chromium
SDG NUMBER: L6891 (Level III)

SAMPLES:

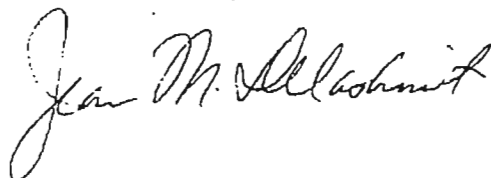
Client	Lab		Volatile	Semi-	Pesticides/	Total	Hexavalent
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Organics</u>	<u>volatiles</u>	<u>PCB's</u>	<u>Metals</u>	<u>Chromium</u>
039GW00102	L6891-10/21/8/1	Water	X	X		X	X
039GW00202	L6891-13/23/9/2	Water	X	X		X	X
038GW01D01	L6891-12/7	Water			X	X	
002GW00202	L6891-3	Water				X	
002GW00402	L6891-4	Water				X	
002GW00502	L6891-5	Water				X	
002GW00602	L6891-6	Water				X	
039TW00202	L6891-16	Water	X				
039GW00102MD	L6891-1MD	Water					+
039GW00102MS	L6891-1MS	Water					+

+ = Non-billable Quality Control Sample

MD = MATRIX DUPLICATE, MS = MATRIX SPIKE, TW = TRIP BLANK

DATA REVIEWER(S): Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions:

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.
- N - The compound/analyte is presumably present.
- NJ - The compound/analyte is presumably present at an estimated quantity.

DATA QUALIFICATION SUMMARY

Lockheed Analytical Services - L6891 Level III, CLP Organics and Inorganics

SAMPLES: 039GW00102, 039GW00202, 038GW01D01, 002GW00202, 002GW00402,
002GW00502, 002GW00602, 039TW00202, 039GW00102MD, 039GW00102MS

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC/MS Tuning:

All GC/MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviations (%RSD's) exceeded the 30% QC limit for the standards analyzed on 4/23/96 on instrument E for the following compounds:

bromomethane	41.5%
chloroethane	56.2%
trichlorofluoromethane	33.3%

These compounds were not detected in the associated samples. No action was necessary.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 4/29/96 at 20:17 on instrument E for the following compounds:

chloromethane	29.0%
bromomethane	51.8%
chloroethane	57.0%
trichlorofluoromethane	64.8%
2-butanone	43.1%
4-methyl-2-pentanone	53.2%
1,1,2,2-tetrachloroethane	35.9%
2-hexanone	53.2%
dibromochloromethane	31.4%

The results for these compounds in associated samples 039GW00102 and 039GW00202, which consisted entirely of non-detects, were flagged as estimated (UJ).

IV.) Blanks:

Method Blank:

There were no positive detections in the method blank. No action was necessary.

Trip Blank:

Acetone, 2-butanone and chloroform were detected at 13 ug/L, 2.4 ug/L and 3.4 ug/L, respectively, in trip blank 039TW00202. The positive result for acetone in associated sample 039GW00102, which was below 10X the blank amount, was flagged as undetected (U) with the detection limit being raised to the amount of contamination in the sample. There were no positive detections of 2-butanone or chloroform in the associated samples. No further action was necessary.

TIC's:

There were no positive TIC detections in the method or trip blanks, so no action was taken.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Laboratory Control Samples (LCS):

Two LCS's were analyzed with this SDG. The %R's for trichloroethene were below the QC limits in both LCS's. Data validation action based on LCS recoveries was not required. No action was taken.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

There were no MS / MSD analyses performed in this SDG. No action was taken.

VIII.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was necessary.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met. No action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

SEMIVOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met. No action was necessary.

II.) GC/MS Tuning:

All GC/MS Tuning criteria were met, so no action was taken.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviation (%RSD) for 2,4-dinitrophenol (38.4%) exceeded the 30% QC limit for the standards analyzed on 5/13/96 on instrument M. This compound was not detected in the associated samples. No action was necessary.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 5/13/96 at 15:24 on instrument M for the following compounds:

2-methylphenol	48.2%
4-nitrophenol	26.5%

The results for these compounds in associated samples 039GW00102 and 039GW00202, which consisted entirely of non-detects, were flagged as estimated (UJ).

IV.) Blanks:

There were no positive detections in the method blank. No action was required.

TIC's:

All TIC criteria were met, so no action was necessary.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was taken.

VI.) Laboratory Control Samples (LCS):

Three LCS's were analyzed in this SDG. All criteria were met. No action was taken.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

There were no MS / MSD analyses performed in this SDG. No action was required.

VIII.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was taken.

IX.) Internal Standards Performance (ISTD's):

All Internal Standard Performance criteria were met, so no action was taken.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was required.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was taken.

XII.) Tentatively Identified Compounds (TIC's):

All TIC criteria were met, so no action was necessary.

XIII.) System Performance:

All System Performance criteria were met, so no action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

PESTICIDES/PCB's

I.) Holding Times:

All Holding Time criteria were met, so no action was required.

II.) Instrument Performance:

All Instrument Performance criteria were met. No action was taken.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met. No action was necessary.

Continuing Calibration:

All Continuing Calibration criteria were met. No action was required.

IV.) Blanks:

Method Blank:

There were no positive detections in the method blank. No action was taken.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was taken.

VI.) Laboratory Control Samples (LCS):

Three LCS's were analyzed in this SDG. All criteria were met. No action was taken.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

There were no MS / MSD's analyzed in this SDG. No action was necessary.

VIII.) TCL Compound Identification:

Pesticide/PCB Identification Summary (PIS):

All PIS criteria were met. No action was required.

IX.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was necessary.

X.) Pesticide Cleanup Check:

Florisil Cartridge Check:

All criteria were met, so no action was taken.

Gel Permeation Chromatography (GPC):

GPC cleanup was not required for water samples. No action was necessary.

XI.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

TOTAL METALS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was necessary.

III.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Max Conc., ug/L</u>	<u>Action Level, ug/L</u>
ERB	aluminum	102	610
CCB1	antimony	4.00	20.0
ERB	arsenic	3.10	15.5
DWB	barium	146	730
DWB	calcium	4880	24400
ERB	iron	47.3	237
FB	magnesium	530	2650
ERB	manganese	7.60	38.0
DWB	nickel	14.5	72.5
DWB	sodium	28200	141000
ERB	zinc	21.6	108

CCB = Continuing Calibration Blank, DWB = Deionized Water Blank (002DW00202),
ERB = Equipment Rinsate Blank (002EW00202), FB = Field Blank (002FW00202)

The deionized water, equipment rinsate and field blanks were analyzed in SDG L6894. All sample

results greater than the IDL but less than 5X the blank amount (Action Level, ug/L for water samples) for which the contaminated blank was an associated calibration, deionized water, equipment rinsate or field blank were flagged as undetected (U).

Aluminum (-44.9 ug/L) in CCB5 and potassium (-1370 ug/L) in CCB3 had negative results with absolute values greater than the IDL. All associated positive sample results less than 5X the absolute value of the negative blank results and all non-detects were flagged as estimated (J) and (UJ).

IV.) ICP Interference Check Sample Results:

All Percent Recovery criteria were met, so no action was taken.

The following analytes were detected in ICS Solution A at concentrations greater than the IDL:

cadmium	7 ug/L
manganese	4 ug/L

These analytes should not be present. Since neither aluminum, calcium, iron nor magnesium was present in the associated samples at a concentration comparable to or greater than the amount in Solution A, no action was taken.

Negative results were observed in ICS Solution A for the following analytes:

cobalt	-9 ug/L
potassium	-1550 ug/L
sodium	-154 ug/L

Since neither aluminum, calcium, iron nor magnesium was present in the associated samples at a concentration comparable to or greater than the amount in Solution A, no action was taken.

V.) ICP Serial Dilution Analysis:

All Serial Dilution criteria were met. No action was necessary.

VI.) Laboratory Control Samples (LCS):

All LCS Recovery criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

There were no Duplicate Sample Analyses performed in this SDG. No action was taken.

VIII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

The Relative Percent Difference (RPD) was 22.2% for thallium in spiked samples 002GW00102MS and 002GW00102MSD (analyzed in SDG L6884), which exceeded the 20% QC limit for water samples. The non-detect results for thallium in all SDG samples were flagged as estimated (UJ).

The Percent Recoveries (%R's) of selenium were 68.0% in both spiked samples 002GW00102MS and 002GW00102MSD (analyzed in SDG L6884), which were below the 75-125% QC limits. The non-detect results for selenium in all SDG samples were flagged as estimated (UJ). The %R for thallium was 63.2% in spiked sample 002GW00102MS, which was below the 75-125% QC limits. Thallium was previously qualified based on a high RPD. No further action was necessary.

IX.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was taken.

X.) Graphite Furnace Atomic Absorption QC (GFAA):

All GFAA criteria were met. No action was required.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was necessary.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria were met, so no action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

HEXA VALENT CHROMIUM

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was necessary.

III.) Blanks:

Method Blank:

There were no positive detections in the method blank. No action was necessary.

IV.) Laboratory Control Samples (LCS):

All LCS Percent Recovery criteria were met. No action was necessary.

V.) Duplicate Sample Analysis:

All Duplicate Sample Analysis criteria were met. No action was required.

VI.) Matrix Spike Recovery:

All Percent Recovery criteria were met. No action was taken.

VII.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was necessary.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

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DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
PROJECT NUMBER: 8500.14
CONTRACTED LAB: Lockheed Analytical Services
QA/QC LEVEL: EPA Level IV
EPA METHOD: EPA SOW 3/90
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994
SAMPLE MATRIX: Water
TYPES OF ANALYSIS: Total Metals
SDG NUMBER: L6894 (Level IV)

SAMPLES:

Client	Lab		Total
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Metals</u>
002DW00202	L6894-1	Water	X
002EW00202	L6894-2	Water	X
002FW00202	L6894-3	Water	X

D = DEIONIZED WATER BLANK, E = EQUIPMENT RINSATE BLANK, F = FIELD BLANK

DATA REVIEWER(S): Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions:

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.
- N - The compound/analyte is presumably present.
- NJ - The compound/analyte is presumably present at an estimated quantity.

DATA QUALIFICATION SUMMARY

Lockheed Analytical Services - L6894 Level IV, CLP Inorganics

SAMPLES: 002DW00202, 002EW00202, 002FW00202

TOTAL METALS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was necessary.

III.) Blanks:

The following blank results represent the highest detections associated with the samples:

Blank Type/ID#	Analyte	Max. Conc., ug/L	Action Level, ug/L
CCB1	antimony	4.00	20.00
PBW	calcium	14.5	72.5
CCB5	manganese	1.80	9.00
PBW	sodium	96.5	482.5

CCB = Continuing Calibration Blank, PBW = Preparation Blank (Water)

Since the only samples in this SDG were deionized water, equipment rinsate and field blanks, no action was necessary.

Aluminum (-44.9 ug/L) in CCB5 and potassium (-1370 ug/L) in CCB3 had negative results with absolute values greater than the IDL. Since the three samples in this SDG were deionized water, equipment rinsate and field blanks, no action was necessary.

IV.) ICP Interference Check Sample Results:

All Percent Recovery criteria were met, so no action was taken.

The following analytes were present in ICS Solution A at concentrations greater than the IDL:

cadmium	9 ug/L
manganese	4 ug/L

These analytes should not be present. Since neither aluminum, calcium, iron nor magnesium was present in the associated samples at a concentration comparable to or greater than the amount in Solution A, no action was necessary.

Negative results were observed in Solution A for the following analytes:

cobalt	-9 ug/L
sodium	-154 ug/L
potassium	-1550 ug/L

Since neither aluminum, calcium, iron nor magnesium was present in the associated samples at a concentration comparable to or greater than the amount in Solution A, no action was taken.

V.) ICP Serial Dilution Analysis:

All Serial Dilution was not required. No action was necessary.

VI.) Laboratory Control Samples (LCS):

All LCS Recovery criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

There were no Duplicate Sample Analyses performed in this SDG. No action was taken.

VIII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD analyses were not required in this SDG. No action was required.

IX.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was taken.

X.) Graphite Furnace Atomic Absorption QC (GFAA):

All Graphite Furnace criteria were met. No action was required.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was necessary.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria were met, so no action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualifications.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
PROJECT NUMBER: 8500.14
CONTRACTED LAB: Lockheed Analytical Services
QA/QC LEVEL: EPA Level III and IV
EPA METHOD: EPA SOW 3/90
VALIDATION GUIDELINES: *USEPA CLP National Functional Guidelines for Organic Data Review, 1994; USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994*

SAMPLE MATRIX: Water
TYPES OF ANALYSES: Volatile Organics, Semivolatile Organics, Total Metals, Cyanide, Hexavalent Chromium

SDG NUMBER: L6904A (Level IV)
L6904B (Level III)

SAMPLES:

SDG L6904A (Level IV):

Client	Lab		Volatile	Semi-	Total		Hexavalent
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Organics</u>	<u>volatiles</u>	<u>Metals</u>	<u>Cyanide</u>	<u>Chromium</u>
039HW00302*	L6904-23/42	Water	X	X			
	L6904-37/48/2	Water			X	X	X

* = Corresponding sample 039GW00302 was analyzed in SDG L6904B.

H = FIELD DUPLICATE SAMPLE

SDG L6904B (Level III):

Client Sample #	Lab Sample #	Matrix	Volatile Organics	Semi- volatiles	Total Metals	Hexavalent Chromium
039GW00302*	L6904-20/40	Water	X	X		
	L6904-36/1	Water			X	X
039GW00402	L6904-29/46	Water	X	X		
	L6904-39/4	Water			X	X
039GW00402RE	L6904-46RE	Water		X		
039GW00502	L6904-26/44	Water	X	X		
	L6904-38/3	Water			X	X
042GW00102	L6904-11/34	Water	X		X	
042GW00202	L6904-14/35	Water	X		X	
042GW00302	L6904-8/33	Water	X		X	
505GW00102	L6904-5/32	Water	X		X	
042TW00202	L6904-17	Water	X			
039GW00302MS	L6904-1MS	Water	+			+
039GW00302MSD	L6904-1MSD	Water	+			+
505GW00102S	L6904-32S	Water			+	
505GW00102SD	L6904-32SD	Water			+	

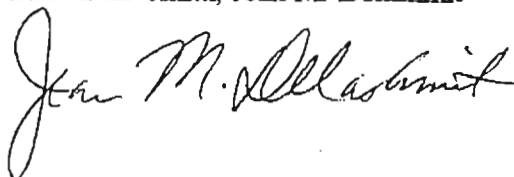
+ = Non-billable Quality Control Sample

* = Corresponding field duplicate sample 039HW00302 was analyzed in SDG L6904A.

MS / S = MATRIX SPIKE, MSD / SD = MATRIX SPIKE DUPLICATE, RE = REANALYSIS,
T = TRIP BLANK

DATA REVIEWER(S): Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions:

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.
- N - The compound/analyte is presumably present.
- NJ - The compound/analyte is presumably present at an estimated quantity.

DATA QUALIFICATION SUMMARY

Lockheed Analytical Services - L6904A Level IV, CLP Organics and Inorganics

SAMPLE: 039HW00302

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC/MS Tuning:

All GC/MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviations (%RSD's) exceeded the 30% QC limit for the standards analyzed on 4/23/96 on instrument E for the following compounds:

bromomethane	41.5%
chloroethane	56.2%
trichlorofluoromethane	33.3%

There were no positive detections of these compounds in the associated sample. No action was necessary.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 5/1/96 at 14:37 on instrument E for the following compounds:

chloroethane	63.5%
bromomethane	34.8%
trichlorofluoromethane	63.1%

The results for these compounds in associated sample 039HW00302, which consisted entirely of non-detects, were flagged as estimated (UJ).

IV.) Blanks:

Method Blank:

There were no positive detections in the method blank. No action was necessary.

Trip Blank:

There were no positive detections in the trip blank, which was analyzed in SDG L6904B. No action was necessary.

TIC's:

There were no positive TIC detections in the method or trip blanks, so no action was taken.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Laboratory Control Samples (LCS):

Six LCS's were analyzed with this SDG. Several %R's were slightly outside the QC limits. Data validation action based on LCS recoveries was not required. No action was necessary.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

All MS / MSD Percent Recovery criteria were met in the associated analyses performed in SDG L6904B. No action was taken.

VIII.) Field Duplicates:

Field duplicate sample 039HW00302 was analyzed in this SDG, and corresponding sample 039GW00302 was analyzed in SDG L6904B. There were no calculable RPD's in this set of field duplicate samples. No action was necessary.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met. No action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

SEMIVOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met. No action was necessary.

II.) GC/MS Tuning:

All GC/MS Tuning criteria were met, so no action was taken.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met. No action was required.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 5/13/96 at 15:24 on instrument M for the following compounds:

2-methylphenol	48.2%
4-nitrophenol	26.5%

The results for these compounds in associated sample 039HW00302, which were both non-detects, were flagged as estimated (UJ).

IV.) Blanks:

Method Blank:

There were no positive detections in the method blank. No action was required.

TIC's:

All TIC criteria were met, so no action was necessary.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was taken.

VI.) Laboratory Control Samples (LCS):

Two LCS's were analyzed with this SDG. All criteria were met. No action was taken.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

There were no MS / MSD analyses performed in this SDG. No action was required.

VIII.) Field Duplicates:

Field duplicate sample 039HW00302 was analyzed in this SDG, and sample 039GW00302 was analyzed in SDG L6904B. There were no calculable RPD's in this set of field duplicate samples. No action was necessary.

IX.) Internal Standards Performance (ISTD's):

All Internal Standard Performance criteria were met, so no action was taken.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was required.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was taken.

XII.) Tentatively Identified Compounds (TIC's):

All TIC criteria were met, so no action was necessary.

XIII.) System Performance:

All System Performance criteria were met, so no action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

TOTAL METALS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was necessary.

III.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Max. Conc., ug/L</u>	<u>Action Level, ug/L</u>
ERB	aluminum	102	610
CCB2	antimony	6.70	33.5
ERB	arsenic	3.10	15.5
DWB	barium	146	730
DWB	calcium	4880	24400
ERB	iron	47.3	237
FB	magnesium	530	2650
ERB	manganese	7.60	38.0
DWB	nickel	14.5	72.5
DWB	sodium	28200	141000
ERB	zinc	21.6	108

CCB = Continuing Calibration Blank, DWB = Deionized Water Blank (002DW00202),
ERB = Equipment Rinsate Blank (002EW00202), FB = Field Blank (002FW00202)

The deionized water, equipment rinsate and field blanks were analyzed in SDG L6894. All sample results greater than the IDL but less than 5X the blank amount (Action Level, ug/L for water samples) for which the contaminated blank was an associated calibration, deionized water, equipment rinsate or field blank were flagged as undetected (U).

Negative results were observed in the continuing calibration blanks (CCB's) for the following analytes:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Neg. Conc.</u>	<u>5X Conc.</u>
CCB5	arsenic	-2.0 ug/L	10.0 ug/L
CCB3	calcium	-13.2 ug/L	66.0 ug/L
CCB4	iron	-6.6 ug/L	33.0 ug/L
CCB1	selenium	-3.9 ug/L	19.5 ug/L

All associated positive sample results less than 5X the absolute value of the negative blank results and all associated non-detects were flagged as estimated (J) and (UJ).

IV.) ICP Interference Check Sample Results:

All Percent Recovery criteria were met, so no action was taken.

Zinc (4 ug/L) was present in ICS Solution A at a concentration greater than the IDL. This analyte should not be present. Additionally, negative results were observed in ICS Solution A for the following analytes:

nickel	-17 ug/L
sodium	-154 ug/L

Since neither aluminum, calcium, iron nor magnesium was present in the associated sample at a concentration comparable to or greater than the amount in Solution A, no action was taken.

V.) ICP Serial Dilution Analysis:

All Serial Dilution criteria were met. No action was necessary.

VI.) Laboratory Control Samples (LCS):

All LCS Recovery criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

There were no Duplicate Sample Analyses performed in this SDG. No action was taken.

VIII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

The Percent Recoveries (%R's) of selenium were 74.0% in both spiked samples 505GW00102MS and 505GW00102MSD (analyzed in SDG L6904B), which were below the 75-125% QC limits. The non-detect result for selenium in sample 039HW00302 was flagged as estimated (UJ). The %R's of aluminum were 137% and 126%, respectively, in spiked samples 505GW00102MS and 505GW00102MSD, which exceeded the 75-125% QC limits. The positive result for aluminum in sample 039HW00302 was flagged as estimated (J).

IX.) Field Duplicates:

Sample 039HW00302 was analyzed in this SDG, and sample 039GW00302 was analyzed in SDG L6904B. The calculable Relative Percent Differences (RPD's) were:

<u>Analyte</u>	<u>039HW00302</u>	<u>039GW00302</u>	<u>RPD</u>
aluminum	1890 ug/L	1990 ug/L	5.2
calcium	56300 ug/L	59000 ug/L	4.7
iron	3260 ug/L	3540 ug/L	9.4
manganese	57.3 ug/L	60.0 ug/L	4.6

All RPD's were within the 30% QC limit for water samples. No action was necessary.

X.) Graphite Furnace Atomic Absorption QC (GFAA):

All GFAA criteria were met. No action was required.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was necessary.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria were met, so no action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

CYANIDE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was necessary.

III.) Blanks:

Method Blank:

Cyanide was not detected in the method blank. No action was necessary.

IV.) Laboratory Control Samples (LCS):

All LCS Percent Recovery criteria were met. No action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was required.

VI.) Matrix Spike Recovery:

No Matrix Spike sample was analyzed in this SDG. No action was taken.

VII.) Field Duplicates:

There were no field duplicate samples in this fraction. No action was necessary.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

HEXAVALENT CHROMIUM

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was necessary.

III.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was necessary.

IV.) Laboratory Control Samples (LCS):

All LCS Percent Recovery criteria were met. No action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was required.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

All MS / MSD Percent Recovery criteria were met. No action was taken.

VII.) Field Duplicates:

The Relative Percent Difference (RPD) was 40.0% for hexavalent chromium in field duplicate samples 039HW00302 and 039GW00302 (analyzed in SDG L6904B), which exceeded the 30% QC limit for water samples. The positive results for this analyte were flagged as estimated (J) in the two samples.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

DATA QUALIFICATION SUMMARY

Lockheed Analytical Services - L6904B Level III, CLP Organics and Inorganics

SAMPLES: 039GW00302, 039GW00402, 039GW00402RE, 039GW00502, 042GW00102,
042GW00202, 042GW00302, 505GW00102, 042GW00202, 039GW00302MS
039GW00302MSD, 505GW00102S, 505GW00102SD

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC/MS Tuning:

All GC/MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviations (%RSD's) exceeded the 30% QC limit for the standards analyzed on 4/23/96 on instrument E for the following compounds:

bromomethane	41.5%
chloroethane	56.2%
trichlorofluoromethane	33.3%

There were no positive detections of these compounds in the associated samples. No action was necessary.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 4/30/96 at 16:18 on instrument E for the following compounds:

chloroethane	55.1%
bromomethane	53.3%

The results for these compounds in associated samples 042GW00102 and 042GW00302, which consisted entirely of non-detects, were flagged as estimated (UJ).

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 5/1/96 at 14:37 on instrument E for the following compounds:

chloroethane	63.5%
bromomethane	34.8%
trichlorofluoromethane	63.1%

The results for these compounds in associated samples 039GW00302 and 042GW00202, which consisted entirely of non-detects, were flagged as estimated (UJ).

IV.) Blanks:

Method Blanks:

Acetone was detected at 5.0 ug/L in method blank 36537MB. The positive detection of acetone in associated sample 039GW00302, which was less than 10X the blank amount, was flagged as undetected (U) with the analytical result below the CRQL being replaced with the CRQL.

Trip Blank:

There were no positive detections in the trip blank. No action was necessary.

TIC's:

There were no positive TIC detections in the method or trip blanks, so no action was taken.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Laboratory Control Samples (LCS):

Six LCS's were analyzed with this SDG. Several %R's were slightly outside the QC limits. Data validation action based on LCS recoveries was not required. No action was necessary.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

All MS / MSD Percent Recovery criteria were met. No action was taken.

VIII.) Field Duplicates:

Sample 039GW00302 was analyzed in this SDG, and field duplicate sample 039HW00302 was analyzed in SDG L6904A. There were no calculable RPD's in this set of field duplicate samples. No action was necessary.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met. No action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XL.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

SEMIVOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met. No action was necessary.

II.) GC/MS Tuning:

All GC/MS Tuning criteria were met, so no action was taken.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met. No action was required.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 5/13/96 at 15:24 on instrument M for the following compounds:

2-methylphenol	48.2%
4-nitrophenol	26.5%

The results for these compounds in associated samples 039GW00302, 039GW00402 and 039GW00502 which consisted entirely of non-detects, were flagged as estimated (UJ).

IV.) Blanks:

Method Blank:

There were no positive detections in the method blank. No action was required.

TIC's:

All TIC criteria were met, so no action was necessary.

V.) Surrogate Recoveries:

The Surrogate Percent Recoveries (%R's) of 2-fluorophenol (23%) and 2,4,6-tribromophenol (18%) were below their respective 31-110% and 34-147% QC limits in sample 039GW00402. All acid fraction compounds, which consisted entirely of non-detects, were flagged as estimated (UJ).

The Surrogate Percent Recoveries (%R's) of 2-fluorophenol (24%) and 2,4,6-tribromophenol (18%) were below their respective 31-110% and 34-147% QC limits in sample 039GW00402RE. All acid fraction compounds, which consisted entirely of non-detects, were flagged as estimated (UJ).

VI.) Laboratory Control Samples (LCS):

Two LCS's were analyzed with this SDG. All Percent Recovery criteria were met. No action was taken.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

There were no MS / MSD analyses performed in this SDG. No action was required.

VIII.) Field Duplicates:

Sample 039GW00302 was analyzed in this SDG, and field duplicate sample 039HW00302 was analyzed in SDG L6904A. There were no calculable RPD's in this set of field duplicate samples. No action was necessary.

IX.) Internal Standards Performance (ISTD's):

All Internal Standard Performance criteria were met, so no action was taken.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was required.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was taken.

XII.) Tentatively Identified Compounds (TIC's):

All TIC criteria were met, so no action was necessary.

XIII.) System Performance:

All System Performance criteria were met, so no action was taken.

XIV.) Overall Assessment of Data/General:

The original analysis of sample 039GW00402 was considered by the validator to be of preferable data quality to the reanalysis because of its slightly better holding time. All laboratory data were acceptable with qualifications.

TOTAL METALS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was necessary.

III.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Max. Conc., ug/L</u>	<u>Action Level, ug/L</u>
ERB	aluminum	102	610
CCB2	antimony	6.70	33.5
ERB	arsenic	3.10	15.5
DWB	barium	146	730
DWB	calcium	4880	24400
ERB	iron	47.3	237
FB	magnesium	530	2650
ERB	manganese	7.60	38.0
DWB	nickel	14.5	72.5
DWB	sodium	28200	141000
ERB	zinc	21.6	108

CCB = Continuing Calibration Blank, DWB = Deionized Water Blank (002DW00202),
ERB = Equipment Rinsate Blank (002EW00202), FB = Field Blank (002FW00202)

The deionized water, equipment rinsate and field blanks were analyzed in SDG L6894. All sample

results greater than the IDL but less than 5X the blank amount (Action Level, ug/L for water samples) for which the contaminated blank was an associated calibration, deionized water, equipment rinsate or field blank were flagged as undetected (U).

Negative results were observed in the continuing calibration blanks (CCB's) for the following analytes:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Neg. Conc.</u>	<u>5X Conc.</u>
CCB5	arsenic	-2.0 ug/L	10.0 ug/L
CCB3	calcium	-13.2 ug/L	66.0 ug/L
CCB4	iron	-6.6 ug/L	33.0 ug/L
CCB1	selenium	-3.9 ug/L	19.5 ug/L

All associated positive sample results less than 5X the absolute value of the negative blank results and all associated non-detects were flagged as estimated (J) and (UJ).

IV.) ICP Interference Check Sample Results:

All Percent Recovery criteria were met, so no action was taken.

Zinc (4 ug/L) was present in ICS Solution A at a concentration greater than the IDL. This analyte should not be present. Since neither aluminum, calcium, iron nor magnesium was present in the associated sample at a concentration comparable to or greater than the amount in Solution A, no action was taken.

Negative results were observed in ICS Solution A for the following analytes:

nickel	-17 ug/L
sodium	-154 ug/L

Since neither aluminum, calcium, iron nor magnesium was present in the associated sample at a concentration comparable to or greater than the amount in Solution A, no action was taken.

V.) ICP Serial Dilution Analysis:

All Serial Dilution criteria were met. No action was necessary.

VI.) Laboratory Control Samples (LCS):

All LCS Recovery criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

There were no Duplicate Sample Analyses performed in this SDG. No action was taken.

VIII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

The Percent Recoveries (%R's) of selenium were 74.0% in both spiked samples 505GW00102MS and 505GW00102MSD, which were below the 75-125% QC limits. The non-detect results for selenium in

all SDG samples were flagged as estimated (UJ). The %R's for aluminum were 137% and 126%, respectively, in spiked samples 505GW00102MS and 505GW00102MSD, which exceeded the 75-125% QC limits. All positive results for aluminum in the associated samples were flagged as estimated (J).

IX.) Field Duplicates:

Sample 039GW00302 was analyzed in this SDG, and field duplicate sample 039HW00302 was analyzed in SDG L6904A. The calculable Relative Percent Differences (RPD's) were:

<u>Analyte</u>	<u>039HW00302</u>	<u>039GW00302</u>	<u>RPD</u>
aluminum	1890 ug/L	1990 ug/L	5.2
calcium	56300 ug/L	59000 ug/L	4.7
iron	3260 ug/L	3540 ug/L	9.4
manganese	57.3 ug/L	60.0 ug/L	4.6

All RPD's were within the 30% QC limit for water samples. No action was necessary.

X.) Graphite Furnace Atomic Absorption QC (GFAA):

All GFAA criteria were met. No action was required.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was necessary.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria were met, so no action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

HEXAVALENT CHROMIUM

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was necessary.

III.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was necessary.

IV.) Laboratory Control Samples (LCS):

All LCS Percent Recovery criteria were met. No action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was required.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

All MS / MSD Percent Recovery criteria were met. No action was taken.

VII.) Field Duplicates:

The Relative Percent Difference (RPD) was 40.0% for hexavalent chromium in field duplicate samples 039HW00302 (analyzed in SDG L6904A) and 039GW00302, which exceeded the 30% QC limit for water samples. The positive results for this analyte were flagged as estimated (J) in the two samples.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: EnSafe/Allen & Hoshall
SITE NAME: Charleston Naval Base, Zone A
PROJECT NUMBER: 8500.014
CONTRACTED LAB: Lockheed Analytical Services
EPA SOW/METHOD: EPA 8290
VALIDATION GUIDELINES: EPA 8290, Professional Judgement
SAMPLE MATRIX: Water
TYPES OF ANALYSES: 2,3,7,8-substituted PCDD's and PCDF's

SDG NUMBER: L6904

SAMPLES:

Client	Lab		PCDD/ PCDF
Sample #	Sample #	Matrix	
039HWO0302	121-51-1	Water	X
GDAHW02D02	121-51-3	Water	X

D = DUPLICATE, MS = MATRIX SPIKE, MSD = MATRIX SPIKE DUPLICATE

DATA REVIEWER(S): Shawn S. Lin, Ph.D., Kevin C. Harmon

RELEASE SIGNATURE:



DATA QUALIFICATION SUMMARY

Lockheed Analytical Services - L6904 2,3,7,8-substituted PCDD's and PCDF's

SAMPLES: 039HWO0302, GDAHW02D02

2,3,7,8-SUBSTITUTED PCDD'S AND PCDF'S

I.) Holding Times:

All criteria were met, so no action was taken.

II.) HRGC/HRMS System Performance:

GC Column Performance:

All criteria were met, so no action was taken.

HRMS Resolution:

All criteria were met, so no action was required.

Mass Verification:

All criteria were met, so no action was taken.

MS Data Acquisition:

All criteria were met, so no action was taken.

III.) Calibration:

Calibration Range:

All criteria were met, so no action was taken.

Initial Calibration and Continuing Calibration Check:

All criteria were met, so no action was taken.

IV.) Blanks:

Method Blanks:

Method Blanks:

All criteria were met, so no action was taken.

Field Blanks:

No field blank was analyzed.

V.) Internal Standards Performance:

The internal standard recoveries for sample GDAH02D02 were below the 40-135% QC limits for the following compounds:

13C-2378TCDD	33.7%
13C-12378PeCDF	31.5%
13C-12378PeCDD	29.6%

All associated sample results were flagged as estimated (J).

VI.) Spike/Spike Duplicates:

One set of LCS/LCSD was analyzed. No results or raw data were submitted.

VII.) Duplicates:

No field duplicates were analyzed.

VIII.) PCDD/PCDF Identifications:

Retention Times:

All criteria were met, so no action was taken.

Ion Abundance:

All criteria were met, so no action was required.

S/N Ratio:

All criteria were met, so no action was taken.

PCDPE (Polychlorinated Diphenyl Ether) Interferences:

All criteria were met, so no action was taken.

Second Column Confirmation:

All criteria were met, so no action was taken.

IX.) Overall Assessment of Data/General:

All data were acceptable with qualifications.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

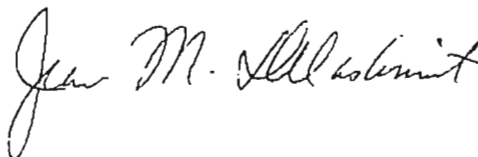
COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
PROJECT NUMBER: 8500.14
CONTRACTED LAB: Lockheed Analytical Services
QA/QC LEVEL: EPA Level IV
EPA METHOD: EPA SOW 3/90
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994
SAMPLE MATRIX: Water
TYPES OF ANALYSIS: Total Metals, Hexavalent Chromium
SDG NUMBER: L6914 (Level IV)

SAMPLE:

<u>Client</u>	<u>Lab</u>	<u>Matrix</u>	<u>Total</u>	<u>Hexavalent</u>
<u>Sample #</u>	<u>Sample #</u>		<u>Metals</u>	<u>Chromium</u>
GDAH02D02	L6914-2/1	Water	X	X

DATA REVIEWER(S): Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions:

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.
- N - The compound/analyte is presumably present.
- NJ - The compound/analyte is presumably present at an estimated quantity.

DATA QUALIFICATION SUMMARY

Lockheed Analytical Services - L6914 Level IV, CLP Inorganics

SAMPLE: GDAH02D02

TOTAL METALS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was necessary.

III.) Blanks:

The following blank results represent the highest detections associated with the sample and were used for data qualification:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Max. Conc., ug/L</u>	<u>Action Level, ug/L</u>
ERB	aluminum	102	610
CCB5	antimony	5.80	29.0
ERB	arsenic	3.10	15.5
DWB	barium	146	730
DWB	calcium	4880	24400
ERB	iron	47.3	237
FB	magnesium	530	2650
ERB	manganese	7.60	38.0
DWB	nickel	14.5	72.5
DWB	sodium	28200	141000
ERB	zinc	21.6	108

CCB = Continuing Calibration Blank, DWB = Deionized Water Blank (002DW00202),
ERB = Equipment Rinsate Blank (002EW00202), FB = Field Blank (002FW00202)

The deionized water, equipment rinsate and field blanks were analyzed in SDG L6894. All sample results greater than the IDL but less than 5X the blank amount (Action Level, ug/L for water samples) for which the contaminated blank was an associated calibration, deionized water, equipment rinsate or field blank were flagged as undetected (U).

Negative results were observed in the continuing calibration blanks (CCB's) for the following analytes:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Neg. Conc.</u>	<u>5X Conc.</u>
CCB5	arsenic	-2.0 ug/L	10.0 ug/L
CCB3	calcium	-13.2 ug/L	66.0 ug/L
CCB4	iron	-6.6 ug/L	33.0 ug/L
CCB1	selenium	-3.9 ug/L	19.5 ug/L

All associated positive sample results were greater than 5X the absolute value of the negative blank results. The associated non-detects were flagged as estimated (UJ).

IV.) ICP Interference Check Sample Results:

All Percent Recovery criteria were met, so no action was taken.

Zinc (4 ug/L) was present in ICS Solution A at a concentration greater than the IDL. This analyte should not be present. Additionally, negative results were observed in Solution A for the following analytes:

nickel	-7 ug/L
sodium	-139 ug/L

Since neither aluminum, calcium, iron nor magnesium was present in the associated sample at a concentration comparable to or greater than the amount in Solution A, no action was taken.

V.) ICP Serial Dilution Analysis:

Serial Dilution Analysis was not performed in this SDG. No action was necessary.

VI.) Laboratory Control Samples (LCS):

All LCS Recovery criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

There were no Duplicate Sample Analyses performed in this SDG. No action was taken.

VIII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

The Percent Recoveries (%R's) of selenium were 74.0% in both spiked samples 505GW00102MS and 505GW00102MSD (analyzed in SDG L6904), which were below the 75-125% QC limits. The non-detect result for selenium in sample GDAHW02D02 was flagged as estimated (UJ). The %R's of aluminum were 137% and 126%, respectively, in spiked samples 505GW00102MS and 505GW00102MSD (analyzed in SDG L6904), which exceeded the 75-125% QC limits. The associated sample result for aluminum was determined to be blank contamination. No action was required.

IX.) Field Duplicates:

Sample GDAGW02D02 was analyzed in SDG L6916 while field duplicate sample GDAHW02D02 was analyzed in this SDG. The calculable Relative Percent Differences (RPD's) were calculable:

Analyte	GDAHW02D02, ug/L	GDAGW02D02, ug/L	RPD
calcium	176000	171000	2.9
iron	22900	22300	2.7
magnesium	436000	423000	3.0
manganese	2380	2310	3.0
potassium	131000	127000	3.1
sodium	3660000	3700000	1.1

Since all RPD's were within the 30% QC limit for water samples, no action was required.

X.) Graphite Furnace Atomic Absorption QC (GFAA):

All Graphite Furnace criteria were met. No action was required.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was necessary.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria were met, so no action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

HEXA VALENT CHROMIUM

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was necessary.

III.) Blanks:

Method Blank:

There were no positive detections in the method blank. No action was necessary.

IV.) Laboratory Control Samples (LCS):

All LCS Percent Recovery criteria were met. No action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was required.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD samples were not analyzed in this SDG. No action was taken.

VII.) Field Duplicates:

Sample 039GW02D02 was analyzed in SDG L6916 while corresponding field duplicate sample 039HW02D02 was analyzed in this SDG. The Relative Percent Difference for hexavalent chromium in this sample set was not calculable. No action was necessary.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
PROJECT NUMBER: 8500.14
CONTRACTED LAB: Lockheed Analytical Services
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3/90
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994; USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994
SAMPLE MATRIX: Water
TYPES OF ANALYSES: Volatile Organics, Semivolatile Organics, Total Metals, Hexavalent Chromium
SDG NUMBER: L6916 (Level III)

SAMPLES:

Client	Lab		Volatile	Semi-	Total	Hexavalent
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Organics</u>	<u>volatiles</u>	<u>Metals</u>	<u>Chromium</u>
039GW04D02	L6916-5/16/151	Water	X	X	X	X
506GW00102	L6916-2	Water	X		X	
GDAGW00102	L6916-12	Water			X	
GDAGW01D02	L6916-13	Water			X	
GDAGW02D02*	L6916-14	Water			X	
039TW04D02	L6916-8	Water	X			
039GW04D02MS	L6916-1MS	Water				+
039GW04D02MSD	L6916-1MSD	Water				+

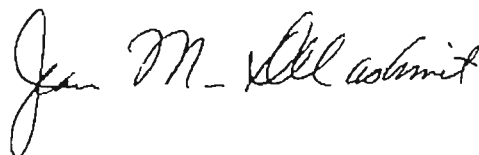
+ = Non-billable Quality Control Sample

* Sample GDAGW02D02 was associated with field duplicate sample GDAHW00302 in SDG L6914.

MS = MATRIX SPIKE, MSD = MATRIX SPIKE DUPLICATE, T = TRIP BLANK

DATA REVIEWER(S): Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions

- J - The association numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Lockheed Analytical Services - L6916 Level III, CLP Organics and Inorganics

SAMPLES: 039GW04D02, 506GW00102, GDAGW00102, GDAGW01D02, GDAGW02D02,
039TW04D02, 039GW04D02MS, 039GW04D02MSD

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC/MS Tuning:

All GC/MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviations (%RSD's) exceeded the 30% QC limit for the standards analyzed on 4/23/96 on instrument E for the following compounds:

bromomethane	41.5%
chloroethane	56.2%
trichlorofluoromethane	33.3%

These compounds were not detected in the associated samples. No action was necessary.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 5/1/96 at 14:37 on instrument E for the following compounds:

bromomethane	34.8%
chloroethane	63.5%
trichlorofluoromethane	63.1%

The results for bromomethane and chloroethane in associated samples 039GW04D02 and 506GW00102, which consisted entirely of non-detects, were flagged as estimated (UJ). The positive and non-detect results for trichlorofluoromethane were flagged as estimated (J) and (UJ).

IV.) Blanks:

Method Blank:

There were no positive detections in the method blank. No action was necessary.

Trip Blank:

Acetone and chloroform were detected at 10 ug/L and 3.2 ug/L, respectively, in trip blank 039TW04D02. Since these compounds were not detected in the associated samples, no action was taken.

TIC's:

There were no TIC's detected in the method or trip blanks, so no action was taken.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Laboratory Control Samples (LCS):

One LCS's was analyzed with this SDG. All Percent Recovery criteria were met. No action was required.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

Associated MS / MSD samples 039GW00302MS and 039GW00302MSD were analyzed in SDG L6904. All Percent Recovery criteria were met. No action was necessary.

VIII.) Field Duplicates:

There were no field duplicate samples for this fraction of this SDG. No action was necessary.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met. No action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XL.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

SEMIVOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met. No action was necessary.

II.) GC/MS Tuning:

All GC/MS Tuning criteria were met, so no action was taken.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviation (%RSD) for 2,4-dinitrophenol (38.4%) exceeded the 30% QC limit for the standards analyzed on 5/13/96 on instrument M. There were no positive detections of this compound in the associated sample. No action was necessary.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 5/13/96 at 15:24 on instrument M for the following compounds:

2-methylphenol	48.2%
4-nitrophenol	26.5%

The non-detect results for these compounds in associated sample 039GW04D02 were flagged as estimated (UJ).

IV.) Blanks:

Method Blank:

There were no positive detections in the method blank. No action was required.

TIC's:

All TIC criteria were met, so no action was necessary.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was taken.

VI.) Laboratory Control Samples (LCS):

Two LCS's were analyzed with this SDG. All criteria were met. No action was taken.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

There were no MS / MSD analyses performed in this SDG. No action was required.

VIII.) Field Duplicates:

There were no field duplicate samples in this fraction. No action was taken.

IX.) Internal Standards Performance (ISTD's):

All Internal Standard Performance criteria were met, so no action was taken.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was required.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was taken.

XII.) Tentatively Identified Compounds (TIC's):

All TIC criteria were met, so no action was necessary.

XIII.) System Performance:

All System Performance criteria were met, so no action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

TOTAL METALS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was necessary.

III.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Max. Conc., ug/L</u>	<u>Action Level, ug/L</u>
ERB	aluminum	102	610
CCB2	antimony	6.70	33.5
ERB	arsenic	3.10	15.5
DWB	barium	146	730
DWB	calcium	4880	24400
ERB	iron	47.3	237
FB	magnesium	530	2650
ERB	manganese	7.60	38.0
DWB	nickel	14.5	72.5
DWB	sodium	28200	141000
ERB	zinc	21.6	108

CCB = Continuing Calibration Blank, DWB = Deionized Water Blank (002DW00202),
ERB = Equipment Rinsate Blank (002EW00202), FB = Field Blank (002FW00202)

The deionized water, equipment rinsate and field blanks were analyzed in SDG L6894. All sample results greater than the IDL but less than 5X the blank amount (Action Level, ug/L for water samples) for which the contaminated blank was an associated calibration, deionized water, equipment rinsate or field blank were flagged as undetected (U).

The following analytes had negative blank results with absolute values greater than the IDL in the continuing calibration blanks (CCB's):

<u>Blank ID#</u>	<u>Analyte</u>	<u>Neg. Conc.</u>	<u>5X Conc.</u>
CCB5	arsenic	-2.0 ug/L	10.0 ug/L
CCB3	calcium	-13.2 ug/L	66.0 ug/L
CCB4	iron	-6.60 ug/L	33.0 ug/L
CCB1	selenium	-3.90 ug/L	19.5 ug/L

All associated positive sample results less than 5X the absolute value of the negative blank results and all associated non-detects were flagged as estimated (J) and (U).

IV.) ICP Interference Check Sample Results:

All Percent Recovery criteria were met, so no action was taken.

Zinc (4 ug/L) was detected in ICS Solution A at a concentration greater than the IDL. This analyte should not be present. Additionally, negative results were observed in ICS Solution A for nickel (-17 ug/L) and sodium (-159 ug/L). Since neither aluminum, calcium, iron nor magnesium was present in the associated samples at a concentration comparable to or greater than the amount in Solution A, no action was taken.

V.) ICP Serial Dilution Analysis:

All Serial Dilution criteria were met. No action was necessary.

VI.) Laboratory Control Samples (LCS):

All LCS Recovery criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

There were no Duplicate Sample Analyses performed in this SDG. No action was taken.

VIII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

The Percent Recoveries (%R's) of aluminum were 137% and 126%, respectively, in spiked samples 505GW00102MS and 505GW00102MSD (analyzed in SDG L6904B), which exceeded the 75-125% QC limits. All positive results for aluminum in the associated samples were flagged as estimated (J). The %R's of selenium were 74.0% in both spiked samples, which were below the 75-125% QC limits. The positive and non-detect results for selenium in all SDG samples were flagged as estimated (J) and (UJ).

IX.) Field Duplicates:

Field duplicate sample GDAHW02D02 was analyzed in SDG L6914 while corresponding sample GDAGW02D02 was analyzed in this SDG. The calculable Relative Percent Differences (RPD's) were:

Analyte	GDAHW02D02, ug/L	GDAGW02D02, ug/L	RPD
calcium	176000	171000	2.9
iron	22900	22300	2.7
magnesium	436000	423000	3.0
manganese	2380	2310	3.0
potassium	131000	127000	3.1
sodium	3660000	3700000	1.1

Since all RPD's were within the 30% QC limit for water samples, no action was required.

X.) Graphite Furnace Atomic Absorption QC (GFAA):

All GFAA criteria were met. No action was required.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was necessary.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria were met, so no action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

HEXA VALENT CHROMIUM

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met. No action was necessary.

III.) Blanks:

There were no positive detections in the method blank. No action was necessary.

IV.) Laboratory Control Samples (LCS):

All LCS Percent Recovery criteria were met. No action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was required.

VI.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

All MS / MSD Percent Recovery and RPD criteria were met. No action was taken.

VII.) Field Duplicates:

The Relative Percent Difference for hexavalent chromium was not calculable in field duplicate pair 039GW02D02 / 039HW02D02 (analyzed in SDG L6914). No action was necessary.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
PROJECT NUMBER: 8500.14
CONTRACTED LAB: Lockheed Analytical Services
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3/90
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994
SAMPLE MATRIX: Water
TYPES OF ANALYSIS: Total Metals
SDG NUMBER: L6926 (Level III)

SAMPLES:

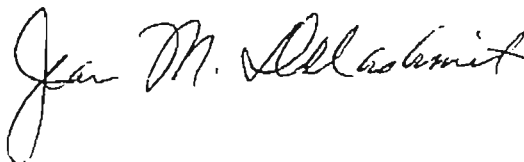
Client	Lab		Total
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Metals</u>
GDAGW00202	L6926-1	Water	X
GDAGW00302	L6926-5	Water	X
GDAGW03D02	L6926-2	Water	X
GDAGW03D02MS	L6926WMS	Water	+
GDAGW03D02MSD	L6926WMSD	Water	+

+ = Non-billable Quality Control Sample

MS = MATRIX SPIKE, MSD = MATRIX SPIKE DUPLICATE

DATA REVIEWER(S): Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions:

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.
- N - The compound/analyte is presumably present.
- NJ - The compound/analyte is presumably present at an estimated quantity.

DATA QUALIFICATION SUMMARY

Lockheed Analytical Services - L6926 Level IV, CLP Inorganics

SAMPLES: GDAGW00202, GDAGW00302, GDAGW03D02, GDAGW03D02MS,
GDAGW03D02MSD

TOTAL METALS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was necessary.

III.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Max Conc., ug/L</u>	<u>Action Level, ug/L</u>
PBW	aluminum	132	660
ERB	arsenic	3.10	15.5
DWB	barium	146	730
DWB	calcium	4880	24400
ERB	iron	47.3	237
FB	magnesium	530	2650
ERB	manganese	7.60	38.0
DWB	nickel	14.5	72.5
DWB	sodium	28200	141000
ERB	zinc	21.6	108

PBW = Preparation Blank (Water), DWB = Deionized Water Blank (002DW00202),
EB = Equipment Rinsate Blank (002EW00202), FB = Field Blank (002FW00202)

The deionized water, equipment rinsate and field blanks were analyzed in SDG L6894. All sample results greater than the IDL but less than 5X the blank amount (Action Level, ug/L for water samples) for which the contaminated blank was an associated preparation, deionized water, equipment rinsate or field blank were flagged as undetected (U).

Potassium (-1410 ug/L) in ICB and selenium (-3.10 ug/L) in CCB3 had negative results with absolute values greater than the IDL. All associated positive sample results less than 5X the absolute value of the negative blank results and all associated non-detects were flagged as estimated (J) and (UJ).

IV.) ICP Interference Check Sample Results:

All Percent Recovery criteria were met, so no action was taken.

Manganese (3 ug/L) was detected in ICS Solution A at a concentration greater than the IDL. This analyte should not be present. Also, negative results were observed in Solution A for the following analytes:

cobalt	-11 ug/L
potassium	-1560 ug/L
sodium	-179 ug/L

Since neither aluminum, calcium, iron nor magnesium was present in the associated sample at a concentration comparable to or greater than the amount in Solution A, no action was taken.

V.) ICP Serial Dilution Analysis:

Serial Dilution Percent Differences (%D's) were 22.6% and 22.0%, respectively, for calcium and manganese in dilution sample GDAGW03D02L, which exceeded the 10% QC limit. All positive results for these two analytes in the associated samples were flagged as estimated (J).

VI.) Laboratory Control Samples (LCS):

All LCS Recovery criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

There were no Duplicate Sample Analyses performed in this SDG. No action was taken.

VIII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

The Percent Recoveries (%R's) were outside the 75-125% QC limits for the following analytes in spiked samples GDAGW03D02MS and GDAGW03D02MSD:

<u>Analyte</u>	<u>MS, %R</u>	<u>MSD, %R</u>
arsenic	43	25
lead	0	0
nickel	72	74
selenium	630	0
silver	74	-
thallium	52	6

All results for arsenic, lead and selenium, which consisted entirely of non-detects, were rejected (R) in all SDG samples. The positive results for thallium in the associated samples were flagged as estimated

(J) and the non-detects were rejected (R). All positive and non-detect results for nickel and silver were flagged as estimated (J) and (UJ).

The Relative Percent Differences (RPD's) of arsenic (52%), selenium (200%) and thallium (61%) exceeded the 20% QC limit for water samples. All results for these three analytes were previously qualified based on the MS / MSD recoveries. No further action was necessary.

IX.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was necessary.

X.) Graphite Furnace Atomic Absorption QC (GFAA):

The Post Digestion Percent Recovery (%R) was 4.5% for thallium in sample GDAGW03D02, which was below the 40% QC limit. The non-detect result for thallium in this sample was previously rejected based on the MS / MSD analyses. No further action was necessary.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was necessary.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria were met, so no action was taken.

XIII.) Overall Assessment of Data/General:

The non-detect results for arsenic, lead, selenium and thallium were rejected in all samples because of very low MS / MSD recoveries. All other laboratory data were acceptable with qualifications.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
SERVICE ORDER NUMBER: 0073
CONTRACTED LAB: Lockheed Analytical Services
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3/90
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994; USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994

SAMPLE MATRIX: Water
TYPES OF ANALYSES: Pesticides/ PCB's, Total Metals, Chloride, Sulfate, TDS

SDG NUMBERS: L7276 (Level III)

SAMPLES:

Client <u>Sample #</u>	Lab <u>Sample #</u>	<u>Matrix</u>	<u>Pesticides/ PCB</u>	<u>Total Metals</u>
002GW00203	L7276-1	Water		X
002GW00303	L7276-2	Water		X
002GW00403	L7276-3	Water		X
038GW00103	L7276-7	Water	X	X
038GW00203	L7276-11	Water	X	X
038GW01D03	L7276-9	Water	X	X
002GW00203MS	L7276-1MS	Water		+
002GW00203MD	L7276-1MD	Water		+
002GW00303MS	L7276-2MS	Water		+
002GW00303MD	L7276-2MD	Water		+

Client <u>Sample #</u>	Lab <u>Sample #</u>	<u>Matrix</u>	<u>Chloride</u>	<u>Sulfate</u>	<u>TDS</u>
038GW00103	L7276-13	Water	X	X	X
038GW00203	L7276-15	Water	X	X	X
038GW01D03	L7276-14	Water	X	X	X

+ = Non-billable Quality Control samples

DATA REVIEWER(S): Amy L. Hogan, Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:

J. Delashmit

Data Qualifier Definitions

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Lockheed Analytical Services - L7276 CLP Organics and Inorganics

SAMPLES: 002GW00203, 002GW00303, 002GW00403, 038GW00103, 038GW00203,
038GW01D03

PESTICIDES/PCB's

I.) Holding Times:

All Holding Time criteria were met, so no action was required.

II.) Instrument Performance:

All Pesticide Instrument Performance criteria were met, so no action was taken.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met, so no action was required.

Continuing Calibration:

All Continuing Calibration criteria were met. No action was required.

IV.) Blanks:

Method Blank:

There were no positive detections in the method blank. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Laboratory Control Samples (LCS):

One LCS was analyzed with this SDG. Several Percent Recoveries were outside QC limits. Data validation action based on LCS recoveries was not required. No action was taken.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD analyses were not performed in this SDG. No action was taken.

VIII.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was required.

IX.) TCL Compound Identification:

Pesticide/PCB Identification Summary (PIS):

All PIS Identification criteria were met. No action was required.

X.) Pesticide Cleanup Check:

Florisil Cartridge Check:

All criteria were met, so no action was taken.

Gel Permeation Chromatography (GPC):

All GPC criteria were met. No action was necessary.

XI.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualifications.

TOTAL METALS AND CYANIDE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met, so no action was necessary.

Continuing Calibration Verification (CCV):

All Continuing Calibration criteria were met, so no action was required.

III.) Blanks:

The following blank results represent the highest detections associated with the samples and were used

for data qualification:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Max. Conc.</u>	<u>Action Level</u>
CCB3	aluminum	63.2 ug/L	316 ug/L
PBW	antimony	11.5 ug/L	57.5 ug/L
PBW	calcium	533 ug/L	2670 ug/L
CCB4	copper	7.30 ug/L	36.5 ug/L
PBW	manganese	7.03 ug/L	35.2 ug/L
PBW	sodium	390 ug/L	1950 ug/L
PBW	zinc	6.65 ug/L	33.3 ug/L

CCB = Continuing Calibration Blank, PBW = Preparation Blank (Water)

All results greater than the IDL but less than 5X the blank amount (Action Level, ug/L for water samples) for which the contaminated blank was an associated calibration or preparation blank were flagged as undetected (U).

The following analyte had a negative result with the absolute value greater than the IDL in the initial calibration blank (ICB):

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Neg. Conc.</u>	<u>Action Level</u>
ICB	tin	-19.1 ug/L	95.5 ug/L

All associated sample results, which consisted entirely of non-detects, were flagged as estimated (UJ).

IV.) ICP Interference Check Sample Results:

All Percent Recovery criteria were met, so no action was taken.

The following analytes were detected in ICS Solution A at concentrations greater than the IDL:

copper	7 ug/L
zinc	9 ug/L

These analytes should not be present. Since neither aluminum, calcium, iron nor magnesium was present in the associated samples at a concentration comparable to or greater than the amount in Solution A, no action was required.

Negative results were observed for cobalt (-6 ug/L), manganese (-3 ug/L), nickel (-13 ug/L) and sodium (-522 ug/L) in ICS Solution A at absolute concentrations greater than the IDL. Since neither aluminum, calcium, iron nor magnesium was present in the associated samples at a concentration comparable to or greater than the amount in Solution A, no action was required.

V.) ICP Serial Dilution Analysis:

The Percent Differences (%D's) exceeded the 10% QC limit for potassium (25.4%) and zinc (265%) in

sample 002GW00303. All positive results for these analytes in the associated samples were flagged as estimated (J).

VI.) Laboratory Control Samples (LCS):

All LCS Recovery criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

All Duplicate Sample Analysis criteria were met. No action was taken.

VIII.) Matrix Spike Recoveries:

The Percent Recoveries (%R's) were below the 75-125% QC limits for thallium (62.6%) and selenium (72.0%) in spiked sample 002GW00203MS. All positive and non-detect results for these analytes in the associated samples were flagged as estimated (J) and (UJ).

IX.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was necessary.

X.) Graphite Furnace Atomic Absorption QC (GFAA):

The Post Digestion Spike Percent Recovery (%R) for selenium was below the 40% QC limit for sample 038GW01D03 (36.0%). The non-detect result for this sample was flagged as estimated (UJ).

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was necessary.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria were met, so no action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

SULFATE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blanks:

Sulfate was detected at 1.25 mg/L in preparation blank PB620EC. All positive results less than 5X the blank amount in the associated samples were flagged as undetected (U) with the detection limit being raised to the level of contamination in each sample.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

MS / MSD analyses were not performed in this fraction of the SDG. No action was required.

VI.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was necessary.

VII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualification.

CHLORIDES

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

MS / MSD analyses were not performed in this SDG fraction. No action was required.

VI.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was necessary.

VII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

TOTAL DISSOLVED SOLIDS (TDS)

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blanks:

TDS was not detected in the method blanks. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

MS / MSD analyses were not performed in this SDG fraction. No action was required.

VI.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was necessary.

VII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

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DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
SERVICE ORDER NUMBER: 0071
CONTRACTED LAB: Lockheed Analytical Services
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3/90
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994; USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994
SAMPLE MATRICES: Soil and Water
TYPES OF ANALYSES: Volatile Organics, Semivolatile Organics, Total Metals, Hexavalent Chromium, Chlorides, Sulfate, TDS
SDG NUMBERS: L7287 (Level III)

SAMPLES:

Client	Lab		Volatile	Semi-	Total
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Organics</u>	<u>Volatiles</u>	<u>Metals</u>
002GW00103	L7287-34	Water			X
002GW00503	L7287-35	Water			X
002GW00603	L7287-36	Water			X
039GW00103	L7287-4	Water	X	X	X
039GW00203	L7287-7	Water	X	X	X
039GW00303	L7287-10	Water	X	X	X
039SP018LH	L7287-37	Soil	X		
039GP018LH	L7287-41	Water	X		
039SP019LH	L7287-39	Soil	X		
039GP019LH	L7287-44	Water	X		
039TB00303	L7287-13	Water	X		
039TP019LH	L7287-47	Water	X		
039EP019LH	L7287-49	Water	X		
039GW00203RE	L7287-7RE	Water		+	
039GW00303RE	L7287-10RE	Water		+	

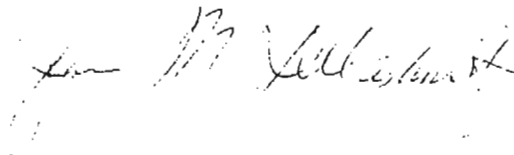
Client	Lab		Hexavalent			
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Chromium</u>	<u>Chloride</u>	<u>Sulfate</u>	<u>TDS</u>
039GW00103	L7287-1	Water	X	X	X	X
039GW00203	L7287-2	Water	X	X	X	X
039GW00303	L7287-3	Water	X	X	X	X

+ = Non-billable Reanalysis sample

E = EQUIPMENT RINSATE BLANK, RE = REANALYSIS, T = TRIP BLANK

DATA REVIEWER(S): Amy L. Hogan, Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Lockheed Analytical Services - L7287 CLP Organics and Inorganics

SAMPLES: 002GW00103, 002GW00503, 002GW00603, 039GW00103, 039GW00203,
039GW00203RE, 039GW00303, 039GW00303RE, 039SP018LH, 039GP018LH,
039SP019LH, 039GP019LH, 039EP019LH, 039TP019LH, 039TB00303

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC/MS Tuning:

All GC/MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviations (%RSD's) exceeded the 30% QC limit for the standards analyzed on 6/25/96 for the following compounds:

bromomethane	32.5%
2-hexanone	62.6%

These compounds were not detected in the associated samples, so no action was required.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 6/24/96 at 16:55 for the following compounds:

chloromethane	25.5%
bromomethane	49.8%
chloroethane	57.6%

The results for these compounds in associated samples 039GW00103 and 039GW00203, which consisted entirely of non-detects, were flagged as estimated (UJ).

The Percent Differences (%D's) exceeded the 25% QC limit for the standards analyzed on 6/25/96 at

18:56 for bromomethane (30.3%). The non-detect results for this compound in associated samples 039GP018LH, 039GP019LH and 039GW00303 were flagged as estimated (UJ).

The Percent Differences (%D's) exceeded the 25% QC limit for the standards analyzed on 6/24/96 at 16:09 for the following compounds:

bromomethane	35.0%
trichlorofluoromethane	83.9%
4-methyl-2-pentanone	26.5%

The results for these compounds in associated samples 039SP018LH and 039SP019LH, which consisted entirely of non-detects, were flagged as estimated (UJ).

IV.) Blanks:

Method Blanks:

There were no positive detections in the method blanks associated with this SDG. No action was required.

Field Blanks:

Carbon disulfide, chloroform, 1,1,1-trichloroethane and bromodichloromethane were detected at 1.3 ug/L, 45 ug/L, 2.1 ug/L and 5.0 ug/L, respectively, in equipment rinsate blank 039EP019LH. There were no positive results for these compounds in the associated samples. No action was necessary.

Trip Blank:

Carbon disulfide was detected at 1.4 ug/L in trip blank 039TP019LH. There were no positive results for this compound in the associated samples. No action was required.

TIC's:

There were no TIC's detected in the method, field or trip blanks. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was necessary.

VI.) Laboratory Control Samples (LCS):

Two LCS's were analyzed with this SDG. All criteria were met. No action was required.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD analyses were not performed in this SDG. No action was required.

VIII.) Field Duplicates:

The calculable Relative Percent Differences (RPD's) for field duplicate samples 039GW00303 and 039HW00303 (analyzed in SDG L7288) were:

<u>Compound</u>	<u>039GW00303</u>	<u>039HW00303</u>	<u>RPD</u>
trichloroethane	92 ug/L	90 ug/L	2.2%
tetrachloroethane	12 ug/L	11 ug/L	8.7%

Since all RPD's were within the 30% QC limit for water samples, no action was required.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was taken.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

SEMIVOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC/MS Tuning:

All GC/MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met. No action was required.

Continuing Calibration:

All Continuing Calibration criteria were met. No action was necessary.

IV.) Blanks:

Method Blanks:

There were no positive detections in the method blanks for this SDG. No action was required.

TIC's:

There were no TIC's detected in the method or field blanks. No action was required.

V.) Surrogate Recoveries:

The Percent Recoveries (%R's) of the following surrogates were outside their respective QC limits for the following samples:

<u>Client Sample #</u>	<u>Surrogate</u>	<u>%R</u>	<u>QC Limits</u>
039GW00203	2-fluorophenol	9.3	31-110%
	phenol-d5	26	27-111%
039GW00303	2-fluorophenol	11	31-110%
	phenol-d5	2.8	27-111%
	2,4,6-tribromophenol	28	34-147%

All results for the acid compounds in these two samples, which consisted entirely of non-detects, were rejected (R), since three %R's were less than 10%.

VI.) Laboratory Control Samples (LCS):

Two LCS's were analyzed with this SDG. Several Percent Recoveries (%R's) were outside the QC limits. Data validation action based on LCS recoveries was not required. No action was taken.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD analyses were not performed in this SDG. No action was required.

VIII.) Field Duplicates:

There were no calculable Relative Percent Differences (RPD's) for field duplicate samples 039GW00303 and 039HW00303 (analyzed in SDG L7288). No action was required.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was taken.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

The original analyses of samples 039GW00203 and 039GW00303 were considered by the validator to be of preferable data quality to the reanalyses because of better holding times. All non-detect acid compound results for samples 039GW00203 and 039GW00303 were rejected due to low surrogate recoveries. All other laboratory data were acceptable with qualifications.

TOTAL METALS AND CYANIDE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met, so no action was necessary.

Continuing Calibration Verification (CCV):

All Continuing Calibration criteria were met, so no action was required.

III.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Max. Conc.</u>	<u>Action Level</u>
CCB3	aluminum	63.2 ug/L	316 ug/L
PBW	antimony	11.5 ug/L	57.5 ug/L
PBW	calcium	533 ug/L	2670 ug/L
CCB4	copper	7.30 ug/L	36.5 ug/L
PBW	manganese	7.03 ug/L	35.2 ug/L
PBW	sodium	390 ug/L	1950 ug/L
PBW	zinc	6.65 ug/L	33.3 ug/L

CCB = Continuing Calibration Blank, PBW = Preparation Blank (Water)

All results greater than the IDL but less than 5X the blank amount (Action Level, ug/L for water samples) for which the contaminated blank was an associated calibration or preparation blank were flagged as undetected (U).

The following analyte had a negative result with an absolute value greater than the IDL:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Neg. Conc.</u>	<u>Action Level</u>
ICB	tin	-19.1 ug/L	95.5 ug/L

ICB = Initial Calibration Blank

All associated sample results, which consisted entirely of non-detects, were flagged as estimated (UJ).

IV.) ICP Interference Check Sample Results:

All Percent Recovery criteria were met, so no action was taken.

The following analytes were detected in ICS Solution A at concentrations greater than the IDL:

copper	7 ug/L
zinc	9 ug/L

These analytes should not be present. Since neither aluminum, calcium, iron nor magnesium was present in the associated samples at a concentration comparable to or greater than the amount in Solution A, no action was required.

Negative results were observed for cobalt (-6 ug/L), manganese (-3 ug/L), nickel (-13 ug/L) and sodium (-522 ug/L) in ICS Solution A at absolute concentrations greater than the IDL. Since neither aluminum, calcium, iron nor magnesium was present in the associated samples at a concentration comparable to or greater than the amount in Solution A, no action was required.

V.) ICP Serial Dilution Analysis:

No Serial Dilution Analysis was performed in this SDG. No action was required.

VI.) Laboratory Control Samples (LCS):

All LCS Recovery criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VIII.) Matrix Spike Recoveries:

Matrix Spike Analysis was not performed in this SDG. No action was required.

IX.) Field Duplicates:

Sample 039GW00303 was analyzed in this SDG, while corresponding sample 039HW00303 was analyzed in SDG L7288. The calculable Relative Percent Differences (RPD's) were:

Analyte	039GW00303, ug/L	039HW00303, ug/L	RPD
barium	22.8	23.8	3.4%
calcium	50100	50900	1.6%
iron	640	672	4.9%
magnesium	3990	4110	3.0%
manganese	63.5	65.8	3.5%
potassium	2460	2390	2.9%
sodium	19900	20500	3.0%

All RPD's were within the 30% QC limit for water samples, so no action was required.

X.) Graphite Furnace Atomic Absorption QC (GFAA):

The Post Digestion Spike Percent Recovery (%R) for selenium was below the 40% QC limit for sample 002GW00503 (28.5%). The non-detect result for selenium in this sample was flagged as estimated (UJ).

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was necessary.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria were met, so no action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

HEXAVALENT CHROMIUM

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blank:

Hexavalent chromium was not detected in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was required.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

MS / MSD analyses were not performed in this SDG. No action was necessary.

VII.) Field Duplicates:

There were no calculable Relative Percent Differences (RPD's) for field duplicate samples 039GW00303 and 039HW00303 (analyzed in SDG L7288). No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

SULFATE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blanks:

Sulfate was detected at 1.25 mg/L in preparation blank PB620EC. All positive results less than 5X the blank amount in the associated samples were flagged as undetected (U) with the detection limit being raised to the level of contamination in each sample.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

MS / MSD analyses were not performed in this SDG. No action was required.

VI.) Field Duplicates:

The Relative Percent Difference (RPD) was 15.4% for field duplicate samples 039GW00303 and 039HW00303 (analyzed in SDG L7288). No action was necessary since the RPD was within the 30% QC limit for water samples.

VII.) Overall Assessment of Data/General:

All laboratory data were acceptable with one qualification.

CHLORIDES

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

There were no positive detections in the method blanks. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

MS / MSD analyses were not performed in this SDG fraction. No action was required.

VI.) Field Duplicates:

There were no calculable Relative Percent Differences (RPD's) for field duplicate samples 039GW00303 and 039HW00303 (analyzed in SDG L7288). No action was taken.

VII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

TOTAL DISSOLVED SOLIDS (TDS)

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

MS / MSD analyses were not performed in this SDG fraction. No action was required.

VI.) Field Duplicates:

The Relative Percent Difference (RPD) was 66.7% for field duplicate samples 039GW00303 and 039HW00303 (analyzed in SDG L7288). The positive results for this compound in these two samples were flagged as estimated (J).

VII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualification.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
SERVICE ORDER NUMBER: 0074
CONTRACTED LAB: Lockheed Analytical Services
QA/QC LEVEL: EPA Level IV
EPA METHOD: EPA SOW 3/90
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994; USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994
SAMPLE MATRIX: Water
TYPES OF ANALYSES: Volatile Organics, Semivolatile Organics, Total Metals, Hexavalent Chromium, Chlorides, Sulfate, TDS
SDG NUMBER: L7288 (Level IV)

SAMPLES:

Client	Lab		Volatile	Semi-	Total
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Organics</u>	<u>Volatiles</u>	<u>Metals</u>
039HW00303	L7288-3	Water	X	X	X
039HW00303RE	L7288-3RE	Water		+	

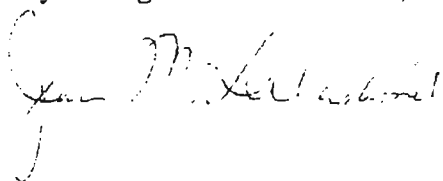
Client	Lab		Hexavalent			
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Chromium</u>	<u>Chloride</u>	<u>Sulfate</u>	<u>TDS</u>
039HW00303	L7288-3	Water	X	X	X	X

+ = Non-billable analysis

RE = REANALYSIS

DATA REVIEWER(S): Amy L. Hogan, Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions

- J - The association numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Lockheed Analytical Services - L7288 Appendix IX CLP Organics and Inorganics

SAMPLE: 039HW00303

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC/MS Tuning:

All GC/MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

The average Relative Response Factors (RRF's) were below the 0.050 QC limit for the standards analyzed on 7/01/96 for bromomethane (0.046), acrolein (0.035) and 1,4-dioxane (0.004). The results for these compounds in associated sample 039HW00303 were rejected (R).

The Percent Relative Standard Deviations (%RSD's) exceeded the 30% QC limit for the standards analyzed on 7/01/96 for the following compounds:

bromomethane	35.8%
1,4-dioxane	38.7%
chloromethane	33.1%
vinyl acetate	49.0%

The results for bromomethane and 1,4-dioxane in the associated sample were previously rejected. The other compounds were not detected in the associated sample. No action was required.

Continuing Calibration:

The Relative Response Factors (RRF's) were below the 0.050 QC limit for the standard analyzed on 7/02/96 at 17:42 for bromomethane (0.031), acrolein (0.042) and 1,4-dioxane (0.007). The results for these compounds in the associated sample were previously rejected based on the initial calibration. No further action was necessary.

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 7/02/96 at

17:42 for the following compounds:

bromomethane	32.5%
1,4-dioxane	65.2%
chloroethane	47.4%
trichlorofluoromethane	51.0%
acetonitrile	57.8%
methylene chloride	50.7%
carbon disulfide	44.1%
acrylonitrile	39.5%

The results for bromomethane and 1,4-dioxane were previously rejected. The results for the other compounds in associated sample 039HW00303, which consisted entirely of non-detects, were flagged as estimated (UJ).

IV.) Blanks:

Method Blanks:

There were no positive detections in the method blanks for this SDG. No action was required.

TIC's:

There were no TIC's detected in the method blanks. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was necessary.

VI.) Laboratory Control Samples (LCS):

Two LCS's were analyzed with this SDG. All criteria were met. No action was required.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD analyses were not performed in this SDG. No action was required.

VIII.) Field Duplicates:

The calculable Relative Percent Differences (RPD's) for field duplicate samples 039HW00303 and 039GW00303 (analyzed in SDG L7287) were:

<u>Compound</u>	<u>039GW00303</u>	<u>039HW00303</u>	<u>RPD</u>
trichloroethane	92 ug/L	90 ug/L	2.2%
tetrachloroethane	12 ug/L	11 ug/L	8.7%

Since all RPD's were within the 30% QC limit for water samples, no action was required.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was taken.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

The non-detect sample results for bromomethane, acrolein and 1,4-dioxane were rejected due to low RRF's in the initial calibration. All other laboratory data were acceptable with qualifications.

SEMIVOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC/MS Tuning:

All GC/MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviations (%RSD's) exceeded the 30% QC limit for the standards analyzed on 7/09/96 for the following compounds:

hexachlorocyclopentadiene	43.9%
famphur	32.8%
n-nitrosomethylethylamine	36.6%
2-methylphenol	37.7%
4-nitroquinoline-1-oxide	35.1%

Since these compounds were not detected in associated sample 039HW00303, no action was required.

Continuing Calibration:

The Percent Difference (%D) exceeded the 25% QC limit for the standards analyzed on 7/10/96 at 14:59 for hexachlorocyclopentadiene (37.4%). The non-detect result for this compound in associated sample 039HW00303 was flagged as estimated (UJ).

IV.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was required.

TIC's:

There were no TIC's detected in the method blanks. No action was required.

V.) Surrogate Recoveries:

The Percent Recoveries (%R's) of the following surrogates were outside their respective QC limits for the following samples:

<u>Client Sample #</u>	<u>Surrogate</u>	<u>%R</u>	<u>QC Limits</u>
039HW00303	2-fluorophenol	3.6%	31-110%
	phenol-d5	3.4%	27-111%
	2,4,6-tribromophenol	15%	34-147%

All results for the acid fraction compounds in this sample, which consisted entirely of non-detects, were rejected (R) since two of the %R's were less than 10%.

VI.) Laboratory Control Samples (LCS):

Two LCS's were analyzed with this SDG. Several Percent Recoveries (%R's) were outside the QC limits. Data validation action based on LCS recoveries was not required. No action was required.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD analyses were not performed in this SDG. No action was required.

VIII.) Field Duplicates:

There were no calculable Relative Percent Differences (RPD's) for field duplicate samples 039HW00303 and 039GW00303 (analyzed in SDG L7287). No action was required.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was taken.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

The original analysis of sample 039HW00303 was considered by the validator to be of preferable data quality to the reanalysis due to better its holding time. All acid compound results for sample 039HW00303 were rejected due to low surrogate recoveries. All other laboratory data were acceptable with qualifications.

TOTAL METALS AND CYANIDE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met, so no action was necessary.

Continuing Calibration Verification (CCV):

All Continuing Calibration criteria were met, so no action was required.

III.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Max. Conc.</u>	<u>Action Level</u>
CCB3	aluminum	63.2 ug/L	316 ug/L
PBW	antimony	11.5 ug/L	57.5 ug/L
PBW	calcium	533 ug/L	2670 ug/L
CCB4	copper	7.30 ug/L	36.5 ug/L
PBW	manganese	7.03 ug/L	35.2 ug/L
PBW	sodium	390 ug/L	1950 ug/L
PBW	zinc	6.65 ug/L	33.3 ug/L

CCB = Continuing Calibration Blank, PBW = Preparation Blank (Water)

All results greater than the IDL but less than 5X the blank amount (Action Level, ug/L for water samples) for which the contaminated blank was an associated calibration or preparation blank were flagged as undetected (U).

The following analyte had a negative result with an absolute value greater than the IDL in the initial calibration blank (ICB):

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Neg. Conc.</u>	<u>Action Level</u>
ICB	tin	-19.1 ug/L	95.5 ug/L

The non-detect sample result for tin was flagged as estimated (UJ).

IV.) ICP Interference Check Sample Results:

All Percent Recovery criteria were met, so no action was taken.

The following analytes were detected in ICS Solution A at concentrations greater than the IDL:

copper	7 ug/L
zinc	9 ug/L

These analytes should not be present. Additionally, negative results were observed for cobalt (-6 ug/L), manganese (-3 ug/L), nickel (-13 ug/L) and sodium (-522 ug/L) in ICS Solution A at absolute concentrations greater than the IDL. Since neither aluminum, calcium, iron nor magnesium was present in the associated samples at a concentration comparable to or greater than the amount in Solution A, no action was required.

V.) ICP Serial Dilution Analysis:

Serial Dilution Analysis was not performed in this SDG. No action was required.

VI.) Laboratory Control Samples (LCS):

All LCS Recovery criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VIII.) Matrix Spike Recoveries:

Matrix Spike Analysis was not performed in this SDG. No action was required.

IX.) Field Duplicates:

Sample 039HW00303 was analyzed in this SDG, while corresponding sample 039GW00303 was analyzed in SDG L7287. The calculable Relative Percent Differences (RPD's) were:

<u>Analyte</u>	<u>039GW00303, ug/L</u>	<u>039HW00303, ug/L</u>	<u>RPD</u>
barium	22.8	23.8	3.4%
calcium	50100	50900	1.6%
iron	640	672	4.9%
magnesium	3990	4110	3.0%
manganese	63.5	65.8	3.5%
potassium	2460	2390	2.9%
sodium	19900	20500	3.0%

All RPD's were within the 30% QC limit for water samples, so no action was required.

X.) Graphite Furnace Atomic Absorption QC (GFAA):

All GFAA criteria were met. No action was required.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was necessary.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria were met, so no action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

HEXA VALENT CHROMIUM

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blank:

Hexavalent chromium was not detected in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

No Duplicate Sample Analysis was performed in this SDG. No action was required.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

No MS / MSD analyses were performed in this SDG. No action was necessary.

VII.) Field Duplicates:

The Relative Percent Difference (RPD) for hexavalent chromium in field duplicate samples 039GW00303 and 039HW00303 (analyzed in SDG L7288) was not calculable. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

SULFATE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blanks:

Sulfate was detected at 1.25 mg/L in preparation blank PB620EC. Since the associated result for sulfate was greater than 5X the blank amount, no action was required.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

No MS / MSD analyses were performed for this fraction of the SDG. No action was required.

VI.) Field Duplicates:

The Relative Percent Difference (RPD) for field duplicate samples 039GW00303 and 039HW00303 (analyzed in SDG L7288) was 15.4%. No action was necessary, since the RPD was within the 30% QC limit for water samples.

VII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

CHLORIDES

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blank:

There were no positive detections in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

MS / MSD analyses were not performed in this SDG fraction. No action was required.

VI.) Field Duplicates:

The Relative Percent Difference (RPD) for chlorides in field duplicate samples 039GW00303 and 039HW00303 (analyzed in SDG L7288) was not calculable. No action was taken.

VII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

TOTAL DISSOLVED SOLIDS (TDS)

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blank:

TDS was not detected in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

MS / MSD analyses were not performed in this SDG fraction. No action was required.

VI.) Field Duplicates:

The Relative Percent Difference (RPD) for field duplicate samples 039GW00303 and 039HW00303 (analyzed in SDG L7288) was 66.7%. The positive results for TDS in these two samples were flagged as estimated (J).

VII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualification.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
SERVICE ORDER NUMBER: 0077
CONTRACTED LAB: Lockheed Analytical Services
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3/90
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994; USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994

SAMPLE MATRIX: Water
TYPES OF ANALYSES: Volatile Organics, Semivolatile Organics, Total Metals, Hexavalent Chromium, Chlorides, Sulfate, TDS

SDG NUMBER: L7294 (Level III)

SAMPLES:

Client Sample #	Lab Sample #	Matrix	Volatile Organics	Semi- Volatiles	Total Metals
039GW00403	L7294-6	Water	X	X	X
039GW00403RE	L7294-6RE	Water		+	
039GW00503	L7294-12	Water	X	X	X
039GW00503RE	L7294-12RE	Water		+	
039GW04D03	L7294-9	Water	X	X	X
042GW00103	L7294-15	Water	X		X
042GW00203	L7294-18	Water	X		X
042GW00303	L7294-21	Water	X		X
042TW00303	L7294-24	Water	X		
505TB02101	L7294-4	Water	X		
039GW00403MS	L7294-6MS	Water	+		
039GW00403MSD	L7294-6MSD	Water	+		

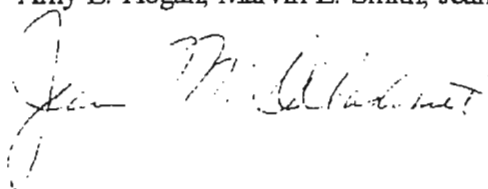
Client Sample #	Lab Sample #	Matrix	Hexavalent Chromium	Chloride	Sulfate	TDS
039GW00403	L7294-1	Water	X	X	X	X
039GW00503	L7294-3	Water	X	X	X	X
039GW04D03	L7294-2	Water	X	X	X	X

+ = Non-billable Quality Control or Reanalysis Sample

RE = REANALYSIS, T = TRIP BLANK

DATA REVIEWER(S): Amy L. Hogan, Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:

A handwritten signature in cursive script, appearing to read "Jean M. Delashmit". The signature is written in dark ink and is positioned to the right of the "RELEASE SIGNATURE:" label.

Data Qualifier Definitions

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Lockheed Analytical Services - L7287 CLP Organics and Inorganics

SAMPLES: 039GW00403, 039GW00403RE, 039GW00503, 039GW00503RE, 039GW04D03,
042GW00103, 042GW00203, 042GW00303, 042TW00303, 505TB02101,
039GW00403MS, 039GW00403MSD

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC/MS Tuning:

All GC/MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviations (%RSD's) exceeded the 30% QC limit for the standards analyzed on 6/25/96 for the following compounds:

bromomethane	32.5%
2-hexanone	62.6%

These compounds were not detected in the associated samples, so no action was required.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 6/27/96 at 16:10 for the following compounds:

chloromethane	32.0%
bromomethane	34.0%
chloroethane	35.0%
2-hexanone	41.4%

The results for these compounds in associated samples 039GW00503, 042GW00103, 042GW00203 and 042GW00303, which consisted entirely of non-detects, were flagged as estimated (UJ).

IV.) Blanks:

Method Blanks:

Bromomethane, 2-butanone, 4-methyl-2-pentanone, 2-hexanone and 1,1,2,2-tetrachloroethane were detected at 3.0 ug/L, 3.5 ug/L, 2.5 ug/L, 3.0 ug/L and 1.4 ug/L, respectively, in method blank MB38514. These compounds were not detected in the associated samples, so no action was required.

Trip Blank:

Acetone, 2-butanone and 1,1,2,2-tetrachloroethane were detected at 6.3 ug/L, 3.6 ug/L and 1.1 ug/L, respectively, in trip blank 042TW00303. The positive results for acetone in associated samples 039GW00403 and 042GW00303, less than 10X the blank amount were flagged as undetected (U) with the detection limits being raised to the level of contamination in each sample. There were no positive results for the other compounds in the associated samples. No further action was required.

Acetone and methylene chloride were detected at 6.5 ug/L and 1.1 ug/L, respectively, in trip blank 505TB02101. There were no positive results for these compounds in the associated samples. No action was taken.

TIC's:

There were no TIC's detected in the method or trip blanks. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was necessary.

VI.) Laboratory Control Samples (LCS):

Two LCS's were analyzed with this SDG. All criteria were met. No action was required.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

All MS / MSD criteria were met. No action was required.

VIII.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was required.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was taken.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

SEMIVOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC/MS Tuning:

All GC/MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviations (%RSD's) exceeded the 30% QC limit for the standards run on 7/01/96 for the following compounds:

2,4-dinitrophenol	38.6%
4,6-dinitro-2-methylphenol	30.4%

These compounds were not detected in the associated samples, so no action was required.

Continuing Calibration:

The Percent Difference (%D) exceeded the 25% QC limit for the standard run on 7/09/96 at 10:17 for 2,4-dinitrophenol (25.4%). The non-detect result for this compound in associated sample 039GW00403RE was flagged as estimated (UJ).

The Percent Differences (%D's) exceeded the 25% QC limit for the standard run on 7/15/96 at 11:51 for the following compounds:

4-nitrophenol	32.4%
4-nitroaniline	28.7%
3,3'-dichlorobenzidine	25.5%

The results for these compounds in associated sample 039GW00503RE, which consisted entirely of non-detects, were flagged as estimated (UJ).

IV.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was required.

TIC's:

There were no TIC's detected in the method blanks. No action was required.

V.) Surrogate Recoveries:

The Percent Recoveries (%R's) of the following surrogates were outside their respective QC limits for the following sample:

<u>Client Sample #</u>	<u>Surrogate</u>	<u>%R</u>	<u>QC Limits</u>
039GW00403RE	2-fluorophenol	12	31-110%
	phenol-d5	4.4	27-111%

All positive results for the acid compounds in this sample, which consisted entirely of non-detects were rejected (R), since one of the %R's was less than 10%.

VI.) Laboratory Control Samples (LCS):

Two LCS's were analyzed with this SDG. All criteria were met. No action was required.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD analyses were not performed in this SDG. No action was required.

VIII.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was required.

IX.) Internal Standards Performance (ISTD):

The Percent Recoveries (%R's) were below the 50-200% QC limits for naphthalene (47.0%) and acenaphthene (49.0%) in sample 039GW00503RE. All positive and non-detect results for the compounds quantitated on these ISTD's were flagged as estimated (J) and (UJ).

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

The reanalyses of samples 039GW00403 and 039GW00503 were considered by the validator to be of preferable data quality to the original analyses because of improved surrogate and ISTD recoveries. All acid compound results for sample 039GW00403RE were rejected due to low surrogate recoveries. All other laboratory data were acceptable with qualifications.

TOTAL METALS AND CYANIDE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met, so no action was necessary.

Continuing Calibration Verification (CCV):

All Continuing Calibration criteria were met, so no action was required.

III.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Max. Conc.</u>	<u>Action Level</u>
CCB1	cadmium	3.20 ug/L	16.0 ug/L
PBW	iron	31.2 ug/L	156 ug/L
CCB6	magnesium	86.3 ug/L	432 ug/L
CCB4	manganese	2.20 ug/L	11.0 ug/L
PBW	zinc	5.01 ug/L	25.1 ug/L
CCB5	tin	17.4 ug/L	87.0 ug/L

CCB = Continuing Calibration Blank, PBW = Preparation Blank (Water)

All results greater than the IDL but less than 5X the blank amount (Action Level, ug/L for water samples) for which the contaminated blank was an associated calibration or preparation blank were flagged as undetected (U).

The following analytes had negative results with absolute values greater than the IDL:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Neg. Conc.</u>	<u>Action Level</u>
CCB5	potassium	-1751 ug/L	8760 ug/L
CCB4	sodium	-364 ug/L	1820 ug/L

CCB = Continuing Calibration Blank

All positive results for these analytes less than 5X the absolute value of these analytes and all non-detects in the associated samples were flagged as estimated (J) and (UJ).

IV.) ICP Interference Check Sample Results:

All Percent Recovery criteria were met, so no action was taken.

Zinc (7 ug/L) was detected in ICS Solution A at a concentration greater than the IDL. This analyte should not be present. Additionally, negative results were observed for cobalt (-14 ug/L), manganese (-5 ug/L), sodium (-825 ug/L) and vanadium (-7 ug/L) in ICS Solution A at absolute concentrations greater than the IDL. Since neither aluminum, calcium, iron nor magnesium was present in the associated samples at a concentration comparable to or greater than the amount in Solution A, no action was required.

V.) ICP Serial Dilution Analysis:

No Serial Dilution Analysis was performed in this SDG. No action was required.

VI.) Laboratory Control Samples (LCS):

All LCS Recovery criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

No Duplicate Sample Analysis was performed in this SDG. No action was taken.

VIII.) Matrix Spike Recoveries:

No Matrix Spike Analysis was performed in this SDG. No action was required.

IX.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was required.

X.) Graphite Furnace Atomic Absorption QC (GFAA):

All GFAA criteria were met. No action was necessary.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was necessary.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria were met, so no action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

HEXAVALENT CHROMIUM

I.) Holding Times:

All Holding Time criteria were met. so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blank:

Hexavalent chromium was not detected in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

No Duplicate Sample Analysis was performed in this SDG. No action was required.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

No MS / MSD analyses were performed in this SDG. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

SULFATE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blanks:

Sulfate was detected at 1.25 mg/L in preparation blank PB620EC. All positive results less than 5X the blank amount in the associated samples were flagged as undetected (U) with the detection limit being raised to the level of contamination in each sample.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

No MS / MSD analyses were performed for this fraction of the SDG. No action was required.

VI.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was necessary.

VII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

CHLORIDES

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

No MS / MSD analyses were performed in this SDG fraction. No action was required.

VI.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was taken.

VII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

TOTAL DISSOLVED SOLIDS (TDS)

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

No MS / MSD analyses were performed in this SDG fraction. No action was required.

VI.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was required.

VII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
SERVICE ORDER NUMBER: 0075
CONTRACTED LAB: Lockheed Analytical Services
QA/QC LEVEL: EPA Level IV
EPA METHOD: EPA SOW 3/90
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994; USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994
SAMPLE MATRIX: Water
TYPES OF ANALYSES: Volatile Organics, Semivolatile Organics, Pesticides/PCB's.

SDG NUMBER: L7295 (Level IV)

SAMPLES:

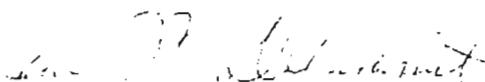
Client <u>Sample #</u>	Lab <u>Sample #</u>	<u>Matrix</u>	<u>Volatile Organics</u>	<u>Semi- volatiles</u>	<u>Pesticides/ PCB's</u>
505DB02101	L7295-1	Water	X	X	X
505EB02101	L7295-8	Water		X	X
505DB02101RE	L7295-1RE	Water		+	

+ = Non-billable Reanalysis Sample

DB = DEIONIZED BLANK, EB = EQUIPMENT RINSATE BLANK

DATA REVIEWER(S): Amy L. Hogan, Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions

- J - The association numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Lockheed Analytical Services - L7295 Appendix IX CLP Organics and Inorganics

SAMPLES: 505DB02101, 505EB02101

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC/MS Tuning:

All GC/MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviations (%RSD's) exceeded the 30% QC limit for the standards analyzed on 6/25/96 for the following compounds:

bromomethane	32.5%
2-hexanone	62.6%

These compounds were not detected in the associated samples. No action was required.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 6/27/96 at 16:10 for the following compounds:

chloromethane	32.0%
bromomethane	34.0%
chloroethane	35.0%
2-hexanone	41.4%

No action was taken, since the associated samples were field blanks.

IV.) Blanks:

Method Blanks:

Bromomethane (3.0 ug/L), 2-butanone (3.5 ug/L), 4-methyl-2-pentanone (2.5 ug/L), 2-hexanone

(3.0 ug/L) and 1,1,2,2-tetrachloroethane (1.4 ug/L) were detected in method blank MB38514. Since the associated sample was a field blank, no action was required.

TIC's:

There were no TIC's detected in the method or field blanks. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was necessary.

VI.) Laboratory Control Samples (LCS):

One LCS was analyzed with this SDG. All criteria were met. No action was required.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

No MS / MSD analyses were performed in this SDG. No action was required.

VIII.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was required.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was taken.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualifications.

SEMIVOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met. No action was required.

II.) GC/MS Tuning:

All GC/MS Tuning criteria were met, so no action was taken.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met. No action was required.

Continuing Calibration:

All Continuing Calibration criteria were met. No action was necessary.

IV.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was required.

TIC's:

There were no TIC detections in the method blanks. No action was taken.

V.) Surrogate Recoveries:

The Percent Recovery (%R) of 2-fluorophenol (28%) was below the 31-110% QC limits for sample 505DB02101. Since only one surrogate was outside the QC limits, no action was required.

VI.) Laboratory Control Samples (LCS):

One LCS was analyzed with this SDG. All criteria were met. No action was necessary.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD analyses were not performed in this SDG. No action was necessary.

VIII.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was required.

IX.) Internal Standards Performance (ISTD's):

All Internal Standards Performance criteria were met. No action was taken.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was required.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was taken.

XII.) Tentatively Identified Compounds (TIC's):

All TIC criteria were met, so no action was necessary.

XIII.) System Performance:

All System Performance criteria were met, so no action was taken.

XIV.) Overall Assessment of Data/General:

The original analysis of sample 505DB02101 was considered by the validator to be of preferable data quality to the reanalysis due to its better holding time. All other laboratory data were acceptable without qualifications.

PESTICIDES/PCB's

I.) Holding Times:

All Holding Time criteria were met, so no action was required.

II.) Instrument Performance:

All Pesticide Instrument Performance criteria were met, so no action was taken.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met, so no action was required.

Continuing Calibration:

All Continuing Calibration criteria were met. No action was required.

IV.) Blanks:

Method Blank:

There were no positive detections in the method blank. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Laboratory Control Samples (LCS):

One LCS was analyzed with this SDG. Several Percent Recovery criteria were not met. Data validation action was not required based on LCS recoveries. No action was taken.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

MS / MSD analyses were not performed in this SDG. No action was taken.

VIII.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was required.

IX.) TCL Compound Identification:

Pesticide/PCB Identification Summary (PIS):

All PIS Identification criteria were met. No action was required.

X.) Pesticide Cleanup Check:

Florisil Cartridge Check:

All criteria were met, so no action was taken.

Gel Permeation Chromatography (GPC):

All GPC criteria were met. No action was necessary.

XI.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualifications.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: EnSafe/Allen & Hoshall
SITE NAME: Charleston Naval Base, Zones A and B
SERVICE ORDER NUMBER: 0082
CONTRACTED LAB: Lockheed Analytical Services
EPA SOW/METHOD: EPA 8290
VALIDATION GUIDELINES: EPA 8290, Professional Judgement
SAMPLE MATRIX: Water
TYPES OF ANALYSES: 2,3,7,8-substituted PCDD's and PCDF's

SDG NUMBERS: L7308/L7309/L7310/L7317/L7330 Level (IV)

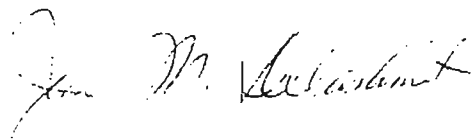
SAMPLES:

Client <u>Sample #</u>	<u>Lab Sample #</u>	<u>Matrix</u>	<u>PCDD/ PCDF</u>
GDBEW00103	L7308-36/129-58-2A	Water	X
GDBFW00103	L7308-38/129-58-3A	Water	X
GDBDW00103	L7308-34/129-58-1A	Water	X
GDAHW02D03	L7309-8/129-58-4A	Water	X
GDAGW00103	L7310-32/129-58-5A	Water	X
GDAGW00203	L7310-36/129-58-7A	Water	X
GDAGW01D03	L7310-34/129-58-6A	Water	X
GDAGW02D03	L7310-38/129-58-8A	Water	X
GDAGW00303	L7317-20/129-58-9A	Water	X
GDAGW03D03	L7317-22/129-58-10A	Water	X
GDAGW03D03MS	L7317-24/129-58-10CMS	Water	X
GDAGW03D03MSD	L7317-26/129-58-10EMS	Water	X
GDBHW04D03	L7330-9/129-58-11A	Water	X

D = DUPLICATE, MS = MATRIX SPIKE, MSD = MATRIX SPIKE DUPLICATE,
RE = REANALYZED

DATA REVIEWER(S): Shawn S. Lin, Ph.D., Kevin C. Harmon

RELEASE SIGNATURE:

A handwritten signature in black ink, appearing to read "Shawn S. Lin", written over a horizontal line.

DATA QUALIFICATION SUMMARY

Lockheed Analytical Services - L7308 / L7309 / L7310 / L7317 / L7330
2,3,7,8-PCDD's and PCDF's

SAMPLES: GDBEW00103, GDBFW00103, GDBDW00103, GDAGW00103, GDAGW00203,
GDAGW01D03, GDAGW02D03, GDAGW00303, GDAGW03D03,
GDAGW03D03MS, GDAGW03D03MSD, GDBHW04D03

2,3,7,8-SUBSTITUTED PCDD'S AND PCDF'S

I.) Holding Times:

All criteria were met, so no action was taken.

II.) HRGC/HRMS System Performance:

GC Column Performance:

All criteria were met, so no action was taken.

HRMS Resolution:

All criteria were met, so no action was required.

Mass Verification:

All criteria were met, so no action was taken.

MS Data Acquisition:

All criteria were met, so no action was taken.

III.) Calibration:

Calibration Range:

All criteria were met, so no action was taken.

Initial Calibration:

All criteria were met, so no action was taken.

Calibration Verifications:

The end calibration verification run on 7/11/96 at 3:30 was not reported. The run time for the sequence was 13 hours, which is outside the 12 hour QC limit. All associated positive sample results were flagged as EMPC (Estimated Maximum Possible Concentration).

IV.) Blanks:

Method Blanks:

The following 2,3,7,8-substituted PCDF was detected in method blanks at the highest concentration indicated:

<u>Method Blank</u>	<u>Compound</u>	<u>Conc.</u> <u>pg/L</u>	<u>Action Level</u> <u>pg/L</u>
TLI Blank	234678-HpCDF	4.2	21

All detections of this compound in the associated samples below 5X the blank amounts were designated as EMPC (Estimated Maximum Possible Concentration).

Field Blanks:

Deionized water blank GDBDW00103, equipment rinsate blank GDBEW00103 and field blank GDBFW00103 were analyzed. There were no positive results in the three field blanks, so no action was taken.

V.) Internal Standards Performance:

The internal standard recoveries (%R's) were above the 40-135% QC limits for the following samples:

<u>Sample</u>	<u>Compound</u>	<u>%R</u>
GDBDW00103	13C-OCDD	146
GDBHW04D03	13C-OCDD	142

All associated positive sample results were flagged as estimated (J).

VI.) Spike/Spike Duplicates:

One set of MS/MSD (GDAGW03D03MS / GDAGW03D03MSD) was analyzed. All criteria were met, so no action was taken.

VII.) Duplicates:

Field duplicate samples GDAGW02D03 and GDAHW02D03 were analyzed. There were no positive sample results in either sample, so RPD's were not calculable.

VIII.) PCDD/PCDF Identifications:

Retention Times:

All criteria were met, so no action was taken.

Ion Abundance:

All criteria were met, so no action was required.

S/N Ratio:

All criteria were met, so no action was taken.

PCDPE (Polychlorinated Diphenyl Ether) Interferences:

All criteria were met, so no action was taken.

Second Column Confirmation:

All criteria were met, so no action was taken.

IX.) Overall Assessment of Data/General:

All data were acceptable with qualifications.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
SERVICE ORDER NUMBER: 0076
CONTRACTED LAB: Lockheed Analytical Services
QA/QC LEVEL: EPA Level IV
EPA METHOD: EPA SOW 3/90
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994; USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994

SAMPLE MATRIX: Water
TYPES OF ANALYSES: Volatile Organics, Semivolatile Organics, Pesticides/PCB's, Total Metals and Cyanide, Hexavalent Chromium, Chlorides, Sulfate, TDS

SDG NUMBER: L7309 (Level IV)

SAMPLE:

Client	Lab		Volatile	Metals/
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Organics</u>	<u>Cyanide</u>
GDAHW02D03*	L7309-2	Water	X	X

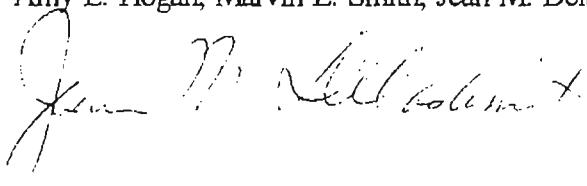
Client	Lab		Hexavalent			
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Chromium</u>	<u>Chloride</u>	<u>Sulfate</u>	<u>TDS</u>
GDAHW02D03	L7309-2	Water	X	X	X	X

* - Associated field duplicate sample GDAGW02D03 was analyzed in SDG L7310.

H = FIELD DUPLICATE

DATA REVIEWER(S): Amy L. Hogan, Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions

- J - The association numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Lockheed Analytical Services - L7309 Appendix IX CLP Organics and Inorganics

SAMPLE: GDAHWO2D03

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC/MS Tuning:

All GC/MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

The average Relative Response Factors (RRF's) were below the 0.050 QC limit for the standards analyzed on 7/01/96 for bromomethane (0.046), acrolein (0.035) and 1,4-dioxane (0.004). The results for these compounds in associated sample GDAHWO2D03, which consisted entirely of non-detects, were rejected (R).

The Percent Relative Standard Deviations (%RSD's) exceeded the 30% QC limit for the standards analyzed on 7/01/96 for the following compounds:

bromomethane	35.8%
1,4-dioxane	38.7%
chloroethane	33.1%
vinyl acetate	49.0%

These compounds were not detected in the associated samples, so no action was required.

Continuing Calibration:

The Relative Response Factors (RRF's) were below the 0.050 QC limit for the standard analyzed on 7/02/96 at 17:42 for bromomethane (0.031), acrolein (0.042) and 1,4-dioxane (0.007). The results for these compounds in the associated sample were previously rejected. No further action was required.

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 7/02/96 at 17:42 for the following compounds:

bromomethane	32.5%
1,4-dioxane	65.2%
chloroethane	47.4%
trichlorofluoromethane	51.0%
acetonitrile	57.8%
methylene chloride	50.7%
carbon disulfide	44.1%
acrylonitrile	39.5%

The results for bromomethane and 1,4-dioxane were previously rejected based on the initial calibration. The results for the other compounds in associated sample GDAHW02D03, which consisted entirely of non-detects, were flagged as estimated (UJ).

IV.) Blanks:

Method Blank:

There were no positive detections in the associated method blank. No action was required.

TIC's:

There were no TIC's detected in the method blanks. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was necessary.

VI.) Laboratory Control Samples (LCS):

One LCS was analyzed with this SDG. All criteria were met. No action was required.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

No MS / MSD analyses were performed for this fraction of the SDG. No action was required.

VIII.) Field Duplicates:

There were no calculable Relative Percent Differences (RPD's) for field duplicate samples GDAHW02D03 and GDAGW02D03 (analyzed in SDG L7310). No action was required.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was taken.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

The non-detect results for bromomethane, acrolein and 1,4-dioxane were rejected in the SDG sample due to low RRF's in the initial and continuing calibrations. All other laboratory data were acceptable with qualifications.

TOTAL METALS AND CYANIDE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met, so no action was necessary.

Continuing Calibration Verification (CCV):

All Continuing Calibration criteria were met, so no action was required.

III.) Blanks:

The following blank results represent the highest detections associated with the sample and were used for data qualification:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Max. Conc.</u>	<u>Action Level</u>
CCB1	cadmium	3.2 ug/L	16.0 ug/L
PBW	iron	31.2 ug/L	156 ug/L
CCB6	magnesium	86.3 ug/L	432 ug/L
CCB4	manganese	2.20 ug/L	11.0 ug/L
PBW	zinc	5.01 ug/L	25.1 ug/L
CCB5	tin	17.4 ug/L	87.0 ug/L

CCB = Continuing Calibration Blank, PBW = Preparation Blank (Water)

All results greater than the IDL but less than 5X the blank amount (Action Level, ug/L for water samples) for which the contaminated blank was an associated calibration or preparation blank were flagged as undetected (U).

The following analytes had negative results with absolute values greater than the IDL:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Neg. Conc.</u>	<u>Action Level</u>
CCB5	potassium	-1751 ug/L	8760 ug/L
CCB4	sodium	-364 ug/L	1820 ug/L

All associated positive sample results were greater than 5X the absolute value of the negative blank result. No action was required.

IV.) ICP Interference Check Sample Results:

All Percent Recovery criteria were met, so no action was taken.

Zinc (7 ug/L) was detected in ICS Solution A at a concentration greater than the IDL. This analyte should not be present. Additionally, negative results were observed for cobalt (-14 ug/L), manganese (-5 ug/L), sodium (-825 ug/L) and vanadium (-7 ug/L) in ICS Solution A at absolute concentrations greater than the IDL. Since neither aluminum, calcium, iron nor magnesium was present in the associated samples at a concentration comparable to or greater than the amount in Solution A, no action was required.

V.) ICP Serial Dilution Analysis:

No Serial Dilution Analysis was performed. No action was taken.

VI.) Laboratory Control Samples (LCS):

All LCS Recovery criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

No Duplicate Sample Analysis were performed in this SDG. No action was taken.

VIII.) Matrix Spike Recoveries:

No MS Analysis was performed in this SDG. No action was required.

IX.) Field Duplicates:

The calculable Relative Percent Differences (RPD's) for field duplicate samples GDAH02D03 and GDAGW02D03 (analyzed in SDG L7310) were:

Analyte	GDAGW02D03, ug/L	GDAHW02D03, ug/L	RPD
barium	182	176	3.6
calcium	177000	174000	1.7
cobalt	18.6	17.2	7.8
iron	22700	22300	1.8
magnesium	438000	431000	1.6
manganese	2480	2430	2.0
potassium	130000	127000	2.3
sodium	3950000	3830000	3.1

All RPD's were within the 30% QC limit for water samples. No action was necessary.

X.) Graphite Furnace Atomic Absorption QC (GFAA):

All Graphite Furnace analyses criteria were met. No action was required.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was necessary.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria were met, so no action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualifications.

HEXAVALENT CHROMIUM

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blank:

Hexavalent chromium was not detected in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

No Duplicate Sample Analysis was performed in this SDG. No action was required.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

No MS / MSD analyses were performed in this SDG. No action was necessary.

VII.) Field Duplicates:

The Relative Percent Difference (RPD) for hexavalent chromium in the field duplicate samples was not calculable. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

SULFATE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blank:

Sulfate was detected at 1.02 mg/L in preparation blank PB625EC. Since the associated positive sample result was greater than 5X the blank amount, no action was taken.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

MS / MSD analyses were not performed in this SDG. No action was required.

VI.) Field Duplicates:

The Relative Percent Difference (RPD) was 8.5% for sulfate in field duplicate samples GDAH02D03 and GDAGW02D03 (analyzed in SDG L7310). Since the RPD was within the 30% QC limit for water samples, no action was required.

VII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

CHLORIDES

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

There were no positive detections in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

No MS / MSD analyses were performed in this SDG fraction. No action was required.

VI.) Field Duplicates:

The Relative Percent Difference (RPD) was 4.6% for chlorides in field duplicate samples GDAH02D03 and GDAGW02D03 (analyzed in SDG L7310). Since the RPD was within the 30% QC limit for water samples, no action was required.

VII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

TOTAL DISSOLVED SOLIDS (TDS)

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

There were no positive detections in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

MS / MSD analyses were not performed in this SDG fraction. No action was required.

VI.) Field Duplicates:

The Relative Percent Difference (RPD) was 8.0% for TDS in field duplicate samples GDAHW02D03 and GDAGW02D03 (analyzed in SDG L7310). Since the RPD was within the 30% QC limit for water samples, no action was required.

VII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
SERVICE ORDER NUMBER: 0078
CONTRACTED LAB: Lockheed Analytical Services
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3/90
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994; USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994

SAMPLE MATRIX: Water
TYPES OF ANALYSES: Volatile Organics, Semivolatile Organics, Pesticides/PCB's, Total Metals and Cyanide, Hexavalent Chromium, Chlorides, Sulfate, TDS

SDG NUMBER: L7310 (Level III)

SAMPLES:

Client	Lab		Volatile	Metals/
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Organics</u>	<u>Cyanide</u>
GDAGW00103	L7310-5	Water	X	X
GDAGW00203	L7310-11	Water	X	X
GDAGW01D03	L7310-8	Water	X	X
GDAGW02D03*	L7310-14	Water	X	X
GDATW02D03	L7310-17	Water	X	
GDAGW00103MS	L7310-5MS	Water	+	
GDAGW00103MSD	L7310-5MSD	Water	+	

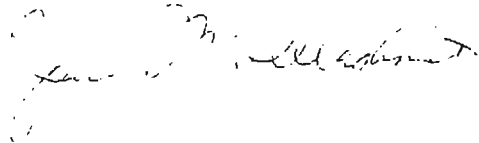
Client	Lab		Hexavalent			
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Chromium</u>	<u>Chloride</u>	<u>Sulfate</u>	<u>TDS</u>
GDAGW00103	L7310-5	Water	X	X	X	X
GDAGW00203	L7310-11	Water	X	X	X	X
GDAGW01D03	L7310-8	Water	X	X	X	X
GDAGW02D03*	L7310-14	Water	X	X	X	X

* - Corresponding field duplicate sample GDAH02D03 was analyzed in SDG L7309.

T = TRIP BLANK

DATA REVIEWER(S): Amy L. Hogan, Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:

Handwritten signature of Jean M. Delashmit.

Data Qualifier Definitions

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Lockheed Analytical Services - L7310 CLP Organics and Inorganics

SAMPLES: GDAGW00103, GDAGW00203, GDAGW01D03, GDAGW02D03, GDATW02D03
GDAGW00103MS, GDAGW00103MSD

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC/MS Tuning:

All GC/MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviations (%RSD's) exceeded the 30% QC limit for the standards analyzed on 6/25/96 for the following compounds:

bromomethane	32.5%
2-hexanone	62.6%

These compounds were not detected in the associated samples, so no action was required.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 6/28/96 at 16:10 for the following compounds:

chloromethane	32.0%
bromomethane	34.0%
chloroethane	35.0%
2-hexanone	41.4%

The results for these compounds in the all samples in this SDG, which consisted entirely of non-detects. were flagged as estimated (UJ).

IV.) Blanks:

Method Blanks:

Bromomethane, 2-butanone, 4-methyl-2-pentanone, 2-hexanone and 1,1,2,2-tetrachloroethane were detected at 3.0 ug/L, 3.5 ug/L, 2.5 ug/L, 3.0 ug/L and 1.4 ug/L, respectively, in method blank MB38514. These compounds were not detected in the associated samples, so no action was required.

Trip Blank:

There were no positive detections in the trip blank in this SDG. No action was necessary.

TIC's:

There were no TIC's detected in the method or trip blanks. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was necessary.

VI.) Laboratory Control Samples (LCS):

One LCS was analyzed with this SDG. All criteria were met. No action was required.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

All MS / MSD criteria were met. No action was required.

VIII.) Field Duplicates:

There were no calculable Relative Percent Differences (RPD's) for field duplicate samples GDAGW02D03 and GDAHW02D03 (analyzed in SDG L7309). No action was required.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was taken.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

TOTAL METALS AND CYANIDE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met, so no action was necessary.

Continuing Calibration Verification (CCV):

All Continuing Calibration criteria were met, so no action was required.

III.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Max. Conc.</u>	<u>Action Level</u>
CCB1	cadmium	3.2 ug/L	16.0 ug/L
PBW	iron	31.2 ug/L	156 ug/L
CCB6	magnesium	86.3 ug/L	432 ug/L
CCB4	manganese	2.20 ug/L	11.0 ug/L
PBW	zinc	5.01 ug/L	25.1 ug/L
CCB5	tin	17.4 ug/L	87.0 ug/L

CCB = Continuing Calibration Blank, PBW = Preparation Blank (Water)

All results greater than the IDL but less than 5X the blank amount (Action Level, ug/L for water samples) for which the contaminated blank was an associated calibration or preparation blank were flagged as undetected (U).

The following analytes had negative results with absolute values greater than the IDL:

<u>Blank</u> <u>Type/ID#</u>	<u>Analyte</u>	<u>Neg. Conc.</u>	<u>Action Level</u>
CCB5	potassium	-1751 ug/L	8760 ug/L
CCB4	sodium	-364 ug/L	1820 ug/L

All associated sample results were greater than 5X the absolute value of the negative blank result. No action was required.

IV.) ICP Interference Check Sample Results:

All Percent Recovery criteria were met, so no action was taken.

Zinc (7 ug/L) was detected in ICS Solution A at a concentration greater than the IDL. This analyte should not be present. Additionally, negative results were observed for cobalt (-14 ug/L), manganese (-5 ug/L), sodium (-825 ug/L) and vanadium (-7 ug/L) in ICS Solution A at absolute concentrations greater than the IDL. Since neither aluminum, calcium, iron nor magnesium was present in the associated samples at a concentration comparable to or greater than the amount in Solution A, no action was required.

V.) ICP Serial Dilution Analysis:

No Serial Dilution Analysis was performed. No action was taken.

VI.) Laboratory Control Samples (LCS):

All LCS Recovery criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

Duplicate Sample Analysis was not performed in this SDG. No action was taken.

VIII.) Matrix Spike Recoveries (MS):

MS Analysis was not performed in this SDG. No action was required.

IX.) Field Duplicates:

The calculable Relative Percent Differences (RPD's) for the field duplicate samples were:

<u>Analyte</u>	<u>GDAGW02D03, ug/L</u>	<u>GDAHW02D03, ug/L</u>	<u>RPD</u>
barium	182	176	3.6%
calcium	177000	174000	1.7%
cobalt	18.6	17.2	7.8%
iron	22700	22300	1.8%
magnesium	438000	431000	1.6%
manganese	2480	2430	2.0%
potassium	130000	127000	2.3%
sodium	3950000	3830000	3.1%

All RPD's were within the 30% QC limit for water samples, so no action was necessary.

X.) Graphite Furnace Atomic Absorption QC (GFAA):

All Graphite Furnace analyses criteria were met. No action was required.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was necessary.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria were met, so no action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

HEXAVALENT CHROMIUM

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blank:

Hexavalent chromium was not detected in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

No Duplicate Sample Analysis was performed in this SDG. No action was required.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

No MS / MSD analyses were performed in this SDG. No action was necessary.

VII.) Field Duplicates:

The Relative Percent Difference (RPD) for hexavalent chromium in field duplicate samples GDAGW02D03 and GDAHW02D03 (analyzed in SDG L7309) was not calculable. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

SULFATE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blanks:

Sulfate was detected at 1.02 mg/L in preparation blank PB625EC. Since there were no positive results less than 5X the blank amount in the associated samples, no action was taken.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

MS / MSD analyses were not performed for this fraction. No action was required.

VI.) Field Duplicates:

The Relative Percent Difference (RPD) was 8.5% for sulfate in field duplicate samples GDAGW02D03 and GDAHW02D03 (analyzed in SDG L7309). Since this RPD was within the 30% QC limit for water samples, no action was taken.

VII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

CHLORIDES

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Chlorides were not detected in the method blanks. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

MS / MSD analyses were not performed in this SDG fraction. No action was required.

VI.) Field Duplicates:

The Relative Percent Difference (RPD) was 4.6% for chlorides in field duplicate samples GDAGW02D03 and GDAHW02D03 (analyzed in SDG L7309). Since this RPD was within the 30% QC limit for water samples, no action was necessary.

VII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

TOTAL DISSOLVED SOLIDS (TDS)

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blanks:

TDS was not detected in the method blanks. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

No MS / MSD analyses were performed in this SDG fraction. No action was required.

VI.) Field Duplicates:

The Relative Percent Difference (RPD) was 8.0% for TDS in field duplicate samples GDAGW02D03 and GDAHW02D03 (analyzed in SDG L7309). Since the RPD was within the 30% QC limit for water samples, no action was required.

VII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
SERVICE ORDER NUMBER: 0080
CONTRACTED LAB: Lockheed Analytical Services
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3/90
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994; USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994
SAMPLE MATRIX: Water
TYPES OF ANALYSES: Volatile Organics, Total Metals and Cyanide, Hexavalent Chromium, Chlorides, Sulfate, TDS
SDG NUMBER: L7317 (Level III)

SAMPLES:

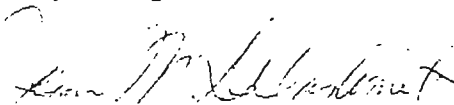
Client Sample #	Lab Sample #	Matrix	Volatile Organics	Metals/ Cyanide
GDAGW00303	L7317-8	Water	X	X
GDAGW03D03	L7317-11	Water	X	X
GDATW00303	L7317-5	Water	X	
GDAGW03D03MS	L7317-11MS	Water	+	+
GDAGW03D03MD	L7317-11MD	Water		+
GDAGW03D03MSD	L7317-11MSD	Water	+	

Client Sample #	Lab Sample #	Matrix	Hexavalent Chromium	Chloride	Sulfate	TDS
GDAGW00303	L7317-8	Water	X	X	X	X
GDAGW03D03	L7317-11	Water	X	X	X	X

+ = Non-billable Quality Control Sample, MD = MATRIX DUPLICATE, MS = MATRIX SPIKE, MSD = MATRIX SPIKE DUPLICATE, T = TRIP BLANK

DATA REVIEWER(S): Amy L. Hogan, Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions

- J - The association numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Lockheed Analytical Services - L7317 CLP Organics and Inorganics

SAMPLES: GDAGW00303, GDAGW03D03, GDATW00303, GDAGW03D03MS,
GDAGW03D03MD, GDAGW03D03MSD

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC/MS Tuning:

All GC/MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviations (%RSD's) exceeded the 30% QC limit for the standards analyzed on 6/25/96 for the following compounds:

bromomethane	32.5%
2-hexanone	62.6%

These compounds were not detected in the associated samples, so no action was required.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 6/28/96 at 16:10 for the following compounds:

chloromethane	32.0%
bromomethane	34.0%
chloroethane	35.0%
2-hexanone	41.4%

The results for these compounds in associated sample GDAGW00303, which consisted entirely of non-detects, were flagged as estimated (UJ).

The Percent Differences (%D's) exceeded the 25% QC limit for the standards analyzed on 6/30/96 at

11:43 for the following compounds:

bromomethane	63.5%
chloroethane	88.4%
2-hexanone	29.0%

The results for these compounds in associated sample GDAGW03D03, which consisted entirely of non-detects, were flagged as estimated (UJ).

IV.) Blanks:

Method Blanks:

Methylene chloride was detected at 4.0 ug/L in method blank VBLK38562. There were no positive results for this compound in the associated samples, so no action was required.

Trip Blank:

There were no positive detections in the trip blank in this SDG. No action was necessary.

TIC's:

There were no TIC's detected in the method or trip blanks. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was necessary.

VI.) Laboratory Control Samples (LCS):

One LCS was analyzed with this SDG. All criteria were met. No action was required.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

All MS / MSD criteria were met. No action was required.

VIII.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was required.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was taken.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

TOTAL METALS AND CYANIDE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met, so no action was necessary.

Continuing Calibration Verification (CCV):

All Continuing Calibration criteria were met, so no action was required.

III.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

Blank Type/ID#	Analyte	Max. Conc.	Action Level
CCB1	cadmium	3.2 ug/L	16.0 ug/L
PBW	iron	31.2 ug/L	156 ug/L
CCB6	magnesium	86.3 ug/L	432 ug/L
CCB4	manganese	2.20 ug/L	11.0 ug/L
PBW	zinc	5.01 ug/L	25.1 ug/L
CCB5	tin	17.4 ug/L	87.0 ug/L

CCB = Continuing Calibration Blank, PBW = Preparation Blank (Water)

All results greater than the IDL but less than 5X the blank amount (Action Level, ug/L for water samples) for which the contaminated blank was an associated calibration or preparation blank were flagged as undetected (U).

The following analytes had negative results with absolute values greater than the IDL:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Neg. Conc.</u>	<u>Action Level</u>
CCB5	potassium	-1751 ug/L	8760 ug/L
CCB4	sodium	-364 ug/L	1820 ug/L

The associated sample results were greater than 5X the absolute value of the negative blank results. No action was required.

IV.) ICP Interference Check Sample Results:

All Percent Recovery criteria were met, so no action was taken.

Zinc (7 ug/L) was detected in ICS Solution A at a concentration greater than the IDL. This analyte should not be present. Additionally, negative results were observed for cobalt (-14 ug/L), manganese (-5 ug/L), sodium (-825 ug/L) and vanadium (-7 ug/L) in ICS Solution A at absolute concentrations greater than the IDL. Since neither aluminum, calcium, iron nor magnesium was present in the associated samples at a concentration comparable to or greater than the amount in Solution A, no action was required.

V.) ICP Serial Dilution Analysis:

The Percent Differences (%D's) exceeded the 10% QC limit for sample GDAGW03D03L for calcium (12.7%) and manganese (13.6%). All associated positive sample results for these analytes were flagged as estimated (J).

VI.) Laboratory Control Samples (LCS):

All LCS Recovery criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

The Relative Percent Difference (RPD) exceeded the 20% QC limit for water samples for sample GDAGW03D03MD for silver (39.2%). All non-detect results for this analyte in the associated samples were flagged as estimated (UJ).

VIII.) Matrix Spike Recoveries:

The Percent Recoveries (%R's) were below the 75-125% QC limit in sample GDAGW03D03MS for arsenic (0.0%), selenium (0.0%), silver (71.9%) and thallium (34.0%). All non-detect results for silver and thallium were flagged as estimated (UJ). The positive results for arsenic and selenium were flagged as estimated (J) and the non-detects were rejected (R), since their %R's were less than 30%.

IX.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was necessary.

X.) Graphite Furnace Atomic Absorption QC (GFAA):

All Graphite Furnace analyses criteria were met. No action was required.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met. No action was necessary.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria were met, so no action was taken.

XIII.) Overall Assessment of Data/General:

The non-detect results for arsenic in sample GDAGW03D03 and selenium in samples GDAGW00303 and GDAGW03D03 were rejected because of MS recoveries of less than 30%. All other laboratory data were acceptable with qualifications.

HEXAVALENT CHROMIUM

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blank:

Hexavalent chromium was not detected in the method blank. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Duplicate Sample Analysis:

No Duplicate Sample Analysis was performed in this SDG. No action was required.

VI.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

No MS / MSD analyses were performed in this SDG. No action was necessary.

VII.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was taken.

VIII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

SULFATE

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blanks:

Sulfate was detected at 1.02 mg/L in preparation blank PB625EC. Since there were no positive results less than 5X the blank amount in the associated samples, no action was taken.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

No MS / MSD analyses were performed for this fraction. No action was required.

VI.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was taken.

VII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

CHLORIDES

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

No MS / MSD analyses were performed in this SDG fraction. No action was required.

VI.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was necessary.

VII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

TOTAL DISSOLVED SOLIDS (TDS)

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was taken.

III.) Blanks:

Method Blanks:

There were no positive detections in the method blanks. No action was necessary.

IV.) Laboratory Check Samples (LCS):

All LCS Percent Recovery criteria were met, so no action was necessary.

V.) Matrix Spike / Matrix Spike Duplicates (MS / MSD):

No MS / MSD analyses were performed in this SDG fraction. No action was required.

VI.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was required.

VII.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

(770) 923-3890

(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
SERVICE ORDER NUMBER: 0085
CONTRACTED LAB: Lockheed Analytical Services
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3/90
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994; USEPA CLP National Functional Guidelines for Inorganic Data Review, 1994

SAMPLE MATRIX: Water
TYPES OF ANALYSES: Volatile Organics, Total Metals

SDG NUMBER: L7335 (Level III)

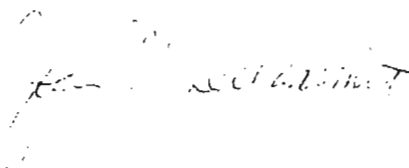
SAMPLES:

Client	Lab		Volatile	Total
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Organics</u>	<u>Metals</u>
505GW00103	L7335-4	Water	X	X
506GW00103	L7335-7	Water	X	X
505TW00103	L7335-1	Water	X	

T = TRIP BLANK

DATA REVIEWER(S): Amy L. Hogan, Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE:



Data Qualifier Definitions

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Lockheed, Inc. - L7335 CLP Organic and Inorganic Analyses

SAMPLES: 505GW00103, 506GW00103, 505TW00103

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC/MS Tuning:

All GC/MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

The Percent Relative Standard Deviations (%RSD's) exceeded the 30% QC limit for the standards analyzed on 6/25/96 for the following compounds:

bromomethane	32.5%
2-hexanone	62.6%

These compounds were not detected in the associated samples, so no action was required.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 6/30/96 at 11:43 for the following compounds:

bromomethane	63.5%
chloroethane	88.4%
2-hexanone	29.0%

The results for these compounds in associated samples 505GW00103 and 506GW00103, which consisted entirely of non-detects, were flagged as estimated (UJ).

IV.) Blanks:

Method Blank:

Methylene chloride was detected at 4.0 ug/L in water method blank VBLK38562. This compound was not detected in the associated samples, so no action was necessary.

Trip Blank:

There were no positive detections in the trip blank in this SDG. No action was required.

TIC's:

All TIC criteria were met, so no action was taken.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met. No action was required.

VI.) Laboratory Control Samples (LCS):

One LCS was analyzed with this SDG. All criteria were met. No action was necessary.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

No MS / MSD analyses were performed in this SDG. No action was taken.

VIII.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was required.

IX.) Internal Standards Performance (ISTD):

All ISTD criteria were met. No action was necessary.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

TOTAL METALS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) Calibration:

All Initial and Continuing Calibration criteria were met, so no action was necessary.

III.) Blanks:

The following blank results represent the highest detections associated with the samples and were used for data qualification:

<u>Blank Type/ID#</u>	<u>Analyte</u>	<u>Max. Conc.</u>	<u>Action Level</u>
CCB5	aluminum	50.1 ug/L	250 ug/L
ICB	calcium	21.1 ug/L	106 ug/L
CCB5	cobalt	6.80 ug/L	34.0 ug/L
CCB5	manganese	3.60 ug/L	18.0 ug/L
PBW	zinc	8.36 ug/L	41.8 ug/L
CCB1	tin	18.2 ug/L	91.0 ug/L

CCB = Continuing Calibration Blank, ICB = Initial Calibration Blank, PBW = Preparation Blank (Water)

All results greater than the IDL but less than 5X the blank amount (Action Level, ug/L for water samples) for which the contaminated blank was an associated calibration or preparation blank were flagged as undetected (U).

IV.) ICP Interference Check Sample Results:

All Percent Recovery criteria were met, so no action was taken.

The following analytes were present in ICS Solution A at concentrations greater than the IDL:

copper	6 ug/L
zinc	6 ug/L

These analytes should not be present. Additionally, negative results were observed for cobalt (-10 ug/L), manganese (-4 ug/L), nickel (-19 ug/L), sodium (-427 ug/L) and tin (-16 ug/L) in ICS Solution A at absolute concentrations greater than the IDL. Since neither aluminum, calcium, iron nor magnesium was present in the associated samples at a concentration comparable to or greater than the amount in ICS Solution A, no action was required.

V.) ICP Serial Dilution Analysis:

All Serial Dilution Analysis criteria were met. No action was required.

VI.) Laboratory Control Samples (LCS):

All LCS Recovery criteria were met. No action was required.

VII.) Duplicate Sample Analysis:

No Duplicate Sample Analysis was performed in this SDG. No action was necessary.

VIII.) Matrix Spike Analysis (MS):

No MS analysis was performed in this SDG. No action was taken.

IX.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was required.

X.) Graphite Furnace Atomic Absorption QC (GFAA):

All GFAA criteria were met. No action was required.

XI.) Sample Result, Calculation/Transcription Verification:

All criteria were met, so no action was necessary.

XII.) Quarterly Verification of Instrumental Parameters:

All criteria were met, so no action was taken.

XIII.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

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(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
SERVICE ORDER NUMBER: 0084
CONTRACTED LAB: Lockheed Analytical Services
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3-90
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994
SAMPLE MATRIX: Water
TYPES OF ANALYSES: Volatile Organics
SDG NUMBER: L7560

SAMPLES:

Client	Lab		Volatile
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Organics</u>
039GW0060A	L7560-7	Water	X
039GW0070A	L7560-1	Water	X
039GW0080A	L7560-4	Water	X
039TW0060A	L7560-10	Water	X
039GW0070AMS	40131MS	Water	+
039GW0070AMSD	40131MSD	Water	+

+ = Non-billable Quality Control Sample

MS / MSD = MATRIX SPIKE / MATRIX SPIKE DUPLICATE, T = TRIP BLANK

DATA REVIEWER(S): Linda H. Liu, Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE: 

Data Qualifier Definitions

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Lockheed Analytical Services - L7560, CLP Organics

SAMPLES: 039GW0060A, 039GW0070A, 039GW0080A, 039TW0060A, 039GW0070AMS
039GW0070AMSD

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met, no action was taken.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 08/12/96 at 1:08 on instrument GCMS-1 for the following compounds:

acetone	46.3%
2-chloroethyl vinyl ether	25.8%

All positive and non-detect results for these compounds in associated samples 039GW0060A, 039GW0070A and 039GW0080A were flagged as estimated (J) and (UJ).

IV.) Blanks:

Method Blank:

Acetone (9.3 ug/L) and 2-butanone (2.2 ug/L) were detected in method blank 40131MB. Acetone was flagged using the trip blank. Since 2-butanone was not detected in the associated samples, no action was taken.

Trip Blanks:

Methylene chloride (1.8 ug/L), acetone (4.3 ug/L), 1,1,1-trichloroethane (2.3 ug/L) were detected in trip blank 039TW0060A. Detections of methylene chloride and acetone in associated samples less than 10X the blank amounts were flagged as undetected (U) with analytical results below the CRQL being replaced with the CRQL. Detections of 1,1,1-trichloroethane in the associated samples less than 5X the blank amounts were flagged as undetected (U) with analytical results below the CRQL being replaced with the CRQL. The associated samples were 039GW0060A, 039GW0070A and 039GW0080A.

TIC's:

All TIC criteria were met. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was required.

VI.) Laboratory Control Samples (LCS):

One LCS was analyzed in this SDG. All Percent Recovery QC limits were met. No action was taken.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

All MS / MSD criteria were met, so no action was taken.

VIII.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was taken.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

VALIDATA

Chemical Services, Inc.

P. O. Box 930422, Norcross, GA 30093

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(770) 923-8769 (Fax)

DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
SERVICE ORDER NUMBER: 0084
CONTRACTED LAB: Lockheed Analytical Services
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3-90
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994
SAMPLE MATRIX: Water
TYPES OF ANALYSES: Volatile Organics
SDG NUMBER: L7570

SAMPLES:

Client <u>Sample #</u>	Lab <u>Sample #</u>	<u>Matrix</u>	<u>Volatile Organics</u>
039GW0090A	L7570-1	Water	X
039GW0120A	L7570-4	Water	X
039GW0100A	L7570-10	Water	X
039TW0090A	L7570-7	Water	X
039GW0070AMS	40131MS	Water	+
039GW0070AMSD	40131MSD	Water	+

+ = Non-billable Quality Control sample

MS = MATRIX SPIKE, MSD = MATRIX SPIKE DUPLICATE, T = TRIP BLANK

DATA REVIEWER(S): Linda H. Liu, Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE: 

Data Qualifier Definitions

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Lockheed Analytical Services - L7570, CLP Organics

SAMPLES: 039GW0090A, 039GW0120A, 039GW0100A, 039TW0090A, 039GW0070AMS
039GW0070AMSD

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met, no action was taken.

Continuing Calibration:

The Percent Differences (%D's) exceeded the 25% QC limit for the standard analyzed on 08/12/96 at 1:08 on instrument GCMS-1 for the following compounds:

acetone	46.3%
2-chloroethyl vinyl ether	25.8%

All positive and non-detect results for these compounds in associated samples 039GW0090A, 039GW0100A, 039GW0120A were flagged as estimated (J) and (UJ).

IV.) Blanks:

Method Blank:

Acetone (9.3 ug/L) and 2-butanone (2.2 ug/L) were detected in method blank 40131MB. Acetone was flagged using the trip blank. 2-Butanone was not detected in the associated samples, so no further action was taken.

Trip Blank:

Methylene chloride (4.2 ug/L) and acetone (7.3 ug/L) were detected in trip blank 039TW0090A. Detections

of methylene chloride and acetone in the associated samples less than 10X the blank amounts were flagged as undetected (U) with analytical results below the CRQL being replaced with the CRQL. The associated samples were 039GW0090A, 039GW0100A, and 039GW0120A.

TIC's:

All TIC criteria were met. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was required.

VI.) Laboratory Control Samples (LCS):

One LCS was analyzed in this SDG. All Percent Recovery QC limits were met. No action was taken.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

All MS / MSD criteria were met, no action was taken.

VIII.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was taken.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

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Chemical Services, Inc.

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(770) 923-3890

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DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
SERVICE ORDER NUMBER: 0084
CONTRACTED LAB: Lockheed Analytical Services
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3-90
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994
SAMPLE MATRIX: Water
TYPE OF ANALYSIS: Volatile Organics
SDG NUMBER: L7586

SAMPLES:

Client <u>Sample #</u>	Lab <u>Sample #</u>	<u>Matrix</u>	<u>Volatile Organics</u>
039GW0110A	L7586-4	Water	X
039GW0110ADL	L7586-4DL	Water	+
039GW12D0A	L7586-7	Water	X
039GW12I0A	L7586-1	Water	X
039TW12D0A	L7586-10	Water	X
039GW0070AMS	40131MS	Water	+
039GW0070AMSD	40131MSD	Water	+

+ = Non-billable Analysis or Quality Control Sample

DL = DILUTION ANALYSIS, MS = MATRIX SPIKE, MSD = MATRIX SPIKE DUPLICATE,
T = TRIP BLANK

DATA REVIEWER(S): Linda H. Liu, Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE: 

Data Qualifier Definitions

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Lockheed Analytical Services - L7586, CLP Organics

SAMPLES: 039GW0110A, 039GW0110ADL, 039GW12D0A, 039GW12I0A, 039TW12D0A,
039GW0070AMS, 039GW0070AMSD

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met, no action was taken.

Continuing Calibration:

All Continuing Calibration criteria were met, no action was taken.

IV.) Blanks:

Method Blank:

Acetone was detected 9.5 ug/L in method blank 40177MB. Acetone was flagged using trip blank. No further action was taken.

Trip Blank:

Acetone was detected at 5.4 ug/L in the trip blank. Detections of acetone in associated samples less than 10X the blank amounts were flagged as undetected (U) with analytical results below the CRQL being replaced with the CRQL. The associated samples were 039GW0110A, 039GW12D0A, and 039GW12I0A.

TIC's:

All TIC criteria were met. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was required.

VI.) Laboratory Control Samples (LCS):

One LCS was analyzed in this SDG. All Percent Recovery QC limits were met. No action was taken.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

All MS / MSD criteria were met. No action was taken.

VIII.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was taken.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

The benzene result for sample 039GW0110A was above the instrument's linear calibration range. The undiluted value was replaced with the diluted value for this compound with appropriate flagging.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable with qualifications.

VALIDATA

Chemical Services, Inc.

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DATA VALIDATION SUMMARY REPORT

COMPANY: Ensafe/Allen & Hoshall
SITE NAME: Charleston Navel Base, Zone A
SERVICE ORDER NUMBER: 0084
CONTRACTED LAB: Lockheed Analytical Services
QA/QC LEVEL: EPA Level III
EPA METHOD: EPA SOW 3-90
VALIDATION GUIDELINES: USEPA CLP National Functional Guidelines for Organic Data Review, 1994
SAMPLE MATRIX: Water
TYPES OF ANALYSES: Volatile Organics
SDG NUMBER: L7633

SAMPLES:

Client	Lab		Volatile
<u>Sample #</u>	<u>Sample #</u>	<u>Matrix</u>	<u>Organics</u>
039GW08D0A	L7633-1	Water	X
039TW08D0A	L7633-4	Water	X
039GW0070AMS	40131MS	Water	+
039GW0070AMSD	40131MSD	Water	+

+ = Non-billable Quality Control sample

MS = MATRIX SPIKE, MSD = MATRIX SPIKE DUPLICATE, T = TRIP BLANK

DATA REVIEWER(S): Linda H. Liu, Marvin L. Smith, Jean M. Delashmit

RELEASE SIGNATURE: 

Data Qualifier Definitions

- J - The associated numerical value is an estimated quantity.
- R - The data are unusable (the compound/analyte may or may not be present). Resampling and reanalysis are necessary for verification.
- U - The compound/analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
- UJ - The compound/analyte was analyzed for, but not detected. The sample quantitation limit is an estimated quantity.

DATA QUALIFICATION SUMMARY

Lockheed Analytical Services - L7633, CLP Organics

SAMPLES: 039GW08D0A, 039TW08D0A, 039GW0070AMS, 039GW0070AMSD

VOLATILE ORGANICS

I.) Holding Times:

All Holding Time criteria were met, so no action was taken.

II.) GC / MS Tuning:

All GC / MS Tuning criteria were met, so no action was required.

III.) Calibration:

Initial Calibration:

All Initial Calibration criteria were met, no action was taken.

Continuing Calibration:

All Continuing Calibration criteria were met, no action was taken.

IV.) Blanks:

Method Blank:

Acetone (9.5 ug/L) was detected in method blank 40177MB. Since acetone was not detected in the associated sample, no action was taken.

Trip Blanks:

Methylene chloride was detected at 2 ug/L in the trip blank. Since methylene chloride was not detected in the associated sample, no action was taken.

TIC's:

All TIC criteria were met. No action was required.

V.) Surrogate Recoveries:

All Surrogate Recovery criteria were met, so no action was required.

VI.) Laboratory Control Samples (LCS):

One LCS was analyzed in this SDG. All Percent Recovery QC limits were met. No action was taken.

VII.) Matrix Spike / Matrix Spike Duplicate (MS / MSD):

All MS / MSD criteria were met, no action was taken.

VIII.) Field Duplicates:

There were no field duplicate samples in this SDG. No action was taken.

IX.) Internal Standards Performance (ISTD):

All Internal Standards Performance criteria were met, so no action was required.

X.) TCL Compound Identification:

All TCL Compound Identification criteria were met, so no action was taken.

XI.) Compound Quantitation and Reported Contract Required Quantitation Limits (CRQL's):

All CRQL criteria were met, so no action was necessary.

XII.) Tentatively Identified Compounds (TIC's):

All TIC Identification criteria were met, so no action was required.

XIII.) System Performance:

All System Performance criteria were met. No action was taken.

XIV.) Overall Assessment of Data/General:

All laboratory data were acceptable without qualification.

Appendix F

Wildlife Toxicity Data

Appendix F
Wildlife Toxicity Data
Baseline Risk Assessment
Zone A
Naval Base Charleston

Chemical	Test Species	Test Type	Duration	Effect	Oral LD ₅₀ (mg/kg/BW)	LOAEL (mg/kgBW/day)	Reference
SVOCs							
Anthracene	Mouse	Oral	NR	Mortality	17000		RTECS, 1993
Benzo(a)pyrene	Rat	Oral (chronic)	Pregnancy	Sterility in offspring		40	USEPA, 1984
	Rat	Oral (chronic)	3.5 months	Reproductive		50	USEPA, 1984
	Rodents	Single oral dose	NR	Mortality	50		Elelar, 1987
Bis(2-ethylhexyl)phthalate	Rat	Oral	NR	Mortality	30600		RTECS, 1993
	Rat	Oral	NR	Reproductive effects		7140	RTECS, 1993
	Rat	Oral	NR	Reproductive effects		35	RTECS, 1993
	Rat	Oral	NR	Reproductive effects		6000	RTECS, 1993
	Rat	Oral	NR	Reproductive effects		17200	RTECS, 1993
	Rat	Oral	NR	Reproductive effects		10000	RTECS, 1993
	Rat	Oral	NR	Reproductive effects		9766	RTECS, 1993
	Mouse	Oral	NR	Mortality	30000		RTECS, 1993
	Mouse	Oral	NR	Reproductive effects		78880	RTECS, 1993
	Mouse	Oral	NR	Reproductive effects		4200	RTECS, 1993
	Mouse	Oral	NR	Reproductive effects		50	RTECS, 1993
	Mouse	Oral	NR	Reproductive effects		1000	RTECS, 1993
	Mouse	Oral	NR	Reproductive effects		2040	RTECS, 1993
	Rabbit	Oral	NR	Mortality	34000		RTECS, 1993
	Guinea pig	Oral	NR	Mortality	26000		RTECS, 1993

Appendix F
Wildlife Toxicity Data
Baseline Risk Assessment
Zone A
Naval Base Charleston

Chemical	Test Species	Test Type	Duration	Effect	Oral LD ₅₀ (mg/kg/BW)	LOAEL (mg/kgBW/day)	Reference
Bis(2-ethylhexyl)phthalate) (Continued)	Guinea pig	Oral	NR	Reproductive effects		20000	RTECS, 1993
	Mammal	Oral	NR	Reproductive effects		20000	RTECS, 1993
	Mammal	Oral	NR	Reproductive effects		509000	RTECS, 1993
	Mouse	Single oral dose		Mortality	800		RTECS, 1993 and NIOSH, 1985
	Mouse	Oral (subchronic)	13 weeks	Renal effects		125	RTECS, 1993
Butylbenzylphthalate	Rat	Oral	NR	Mortality	2330		RTECS, 1994
	Rat	Oral	NR	Reproductive effects		21000	RTECS, 1994
	Rat	Oral	NR	Reproductive effects		16400	RTECS, 1994
	Rat	Oral	NR	Reproductive effects		16400	RTECS, 1994
	Rat	Oral	NR	Reproductive effects		4900	RTECS, 1994
	Mouse	Oral	NR	Mortality	4170		RTECS, 1994
	Guinea Pig	Oral	NR	Mortality	13750		RTECS, 1994
1,4-Dichlorobenzene	Rat	Oral	NR	Mortality	500		RTECS, 1994
	Rat	Oral	NR	Reproductive effects		7500	RTECS, 1994
	Rat	Oral	NR	Reproductive effects		10000	RTECS, 1994
	Mouse	Oral	NR	Mortality	2950		RTECS, 1994
	Rabbit	Oral	NR	Mortality	2830		RTECS, 1994
Di-n-butylphthalate	Rat	Oral (subchronic)	48 days	Reproductive		125	ATSDR, 1989
	Rat	Oral	1 year	Mortality		600	IRIS, 1991

Appendix F
Wildlife Toxicity Data
Baseline Risk Assessment
Zone A
Naval Base Charleston

Chemical	Test Species	Test Type	Duration	Effect	Oral LD ₅₀ (mg/kg/BW)	LOAEL (mg/kgBW/day)	Reference
Fluoranthene	Rat	Oral	NR	Mortality	2000		RTECS, 1994
Phenanthrene	Mouse	Oral	NR	Mortality	700		RTECS, 1994
Pyrene	Rat	Single oral dose	NR	Mortality	2700		RTECS, 1993 and NIOSH, 1985
	Mouse	Single oral dose	NR	Mortality	800		RTECS, 1993 and NIOSH, 1985
Pesticides/PCBs							
Aroclor 1248	Rat	Oral	NR	Mortality	11000		RTECS, 1993
	Rabbit	Oral	NR	Reproductive effects		165	RTECS, 1993
	Monkey	Oral	NR	Reproductive effects		32	RTECS, 1993
	Monkey	Oral	NR	Reproductive effects		55	RTECS, 1993
	Monkey	Oral	NR	Reproductive effects		17	RTECS, 1993
	Monkey	Oral	NR	Reproductive effects		35	RTECS, 1993
	Monkey	Oral	NR	Reproductive effects		24	RTECS, 1993
	Monkey	Oral	NR	Reproductive effects		83	RTECS, 1993
	Chicken	Oral	8-9 weeks	Egg hatchability		4.88	USEPA, 1993
	Chicken	Oral	NR	Egg production and hatchability		9.8	USEPA, 1993
	Chicken	Maternal diet	NR	Chick growth		0.98	USEPA, 1993
	Chicken	Oral	8 weeks	Egg production and hatchability		4.9	USEPA, 1993

Appendix F
Wildlife Toxicity Data
Baseline Risk Assessment
Zone A
Naval Base Charleston

Chemical	Test Species	Test Type	Duration	Effect	Oral LD ₅₀ (mg/kg/BW)	LOAEL (mg/kgBW/day)	Reference
Aroclor 1254	Mouse	Oral	NR	Reproductive		1.53	USEPA, 1993
	Chicken	Oral (chronic)	NR	Embryonic mortality		0.9 ^a	USEPA, 1993
	Rock dove	Oral (chronic)	NR	Parental incubation behavior		0.9 ^a	Peakall and Peakall, 1973
	American kestrel	Oral (chronic)	69 days	Reduced sperm concentration		9	Eisler, 1986
	Mink	Oral dose of contaminated meat	160 days	Reproductive		0.096	USEPA, 1993
Aroclor 1260	Rat	Oral	NR	Mortality	1315		RTECS, 1993
	Rat	Single oral dose	NR	Mortality	500		Eisler, 1986
	Rat	Single oral dose	NR	Mortality	1300		Eisler, 1986
	Rat	Oral	NR	Reproductive effects		1674	RTECS, 1993
	Rat	Oral (chronic)	2 generations	Reduced litter size		7.6	USEPA, 1985
	Rat	Oral (subchronic)	9 weeks	Fetal mortality; maternal toxicity		6.4	ATSDR, 1987
	Mouse	Oral	NR	Reproductive effects		74	RTECS, 1993
	Mink	Single oral dose		Mortality	4000		Eisler, 1986
	Mink	Single oral dose		Mortality	3000		Eisler, 1986
	Mink	Single oral dose		Mortality	750		Eisler, 1986
	Mink	Oral (subchronic)	4 months	Impaired reproduction		0.0075 ^b	Newell et al., 1987
	Chicken	Oral (chronic)	NR	Embryonic mortality		0.9 ^a	USEPA, 1976

Appendix F
Wildlife Toxicity Data
Baseline Risk Assessment
Zone A
Naval Base Charleston

Chemical	Test Species	Test Type	Duration	Effect	Oral LD ₅₀ (mg/kg/BW)	LOAEL (mg/kgBW/day)	Reference
Chlordane	Rat	Oral	NR	Mortality	283		RTECS, 1993
	Rat	Single oral dose		Mortality	430		Allen et al., 1979
	Rat	Single oral dose		Mortality	335		Allen et al., 1979
	Rabbit	Single oral dose		Mortality	300		Allen et al., 1979
	Rabbit	Single oral dose		Mortality	100		Allen et al., 1979
	Dog	Single oral dose		Mortality	200		Allen et al., 1979
	Goat	Single oral dose		Mortality	180		Allen et al., 1979
	Japanese quail	Oral (acute)	5 days	Mortality	35 *		Hill et al., 1975
	Bobwhite	Oral (acute)	5 days	Mortality	29 *		Hill et al., 1975
	Mallard	Oral (acute)	5 days	Mortality	62 *		Hill et al., 1975
	Pheasant	Single oral dose		Mortality	24		USFWS, 1984
4,4'-DDE	Rat	Oral	NR	Mortality	800		RTECS, 1993
	Mouse	Oral	NR	Mortality	700		RTECS, 1993
	Hamster	Oral	NR	Mortality	> 5000		RTECS, 1993
	Mallard	Oral	NR	Eggshell thinning		2.91	USEPA, 1993
	Mallard	Oral	2 years	Reproductive: embryo mortality, cracked eggs		0.58	USEPA, 1993
	Kestrel	Oral	NR	Eggshell thinning		0.39	USEPA, 1993
4,4'-DDT	Rat	Oral	NR	Mortality	87		RTECS, 1993
	Rat	Single oral dose		Mortality	100		USEPA, 1985

Appendix F
Wildlife Toxicity Data
Baseline Risk Assessment
Zone A
Naval Base Charleston

Chemical	Test Species	Test Type	Duration	Effect	Oral LD ₅₀ (mg/kg/BW)	LOAEL (mg/kgBW/day)	Reference
4,4'-DDT (Continued)	Rat	Oral	NR	Reproductive		112	RTECS, 1993
	Rat	Oral	NR	Reproductive		100	RTECS, 1993
	Rat	Oral	NR	Reproductive		430	RTECS, 1993
	Rat	Oral	NR	Reproductive		1890	RTECS, 1993
	Rat	Oral	NR	Reproductive		250	RTECS, 1993
	Rat	Oral	NR	Reproductive		50	RTECS, 1993
	Rat	Oral (chronic)	3 generations	Reproductive		0.2	IRIS, 1991
	Rat	Oral	2 years	Reproductive		2.5	USEPA, 1993
	Mouse	Oral	NR	Mortality	135		RTECS, 1993
	Mouse	Single oral dose		Mortality	200		USEPA, 1985
	Mouse	Oral	NR	Reproductive		504	RTECS, 1993
	Mouse	Oral	NR	Reproductive		81	RTECS, 1993
	Mouse	Oral	NR	Reproductive		124	RTECS, 1993
	Mouse	Oral	NR	Reproductive		148	RTECS, 1993
	Rabbit	Oral	NR	Mortality	250		RTECS, 1993
	Rabbit	Oral	NR	Reproductive		150	RTECS, 1993
	Guinea pig	Oral	NR	Mortality	150		RTECS, 1993
	Hamster	Oral	NR	Mortality	> 5000		RTECS, 1993
	Dog	Oral	NR	Mortality	150		RTECS, 1993
	Dog	Single oral dose		Mortality	60		USEPA, 1985

Appendix F
Wildlife Toxicity Data
Baseline Risk Assessment
Zone A
Naval Base Charleston

Chemical	Test Species	Test Type	Duration	Effect	Oral LD ₅₀ (mg/kg/BW)	LOAEL (mg/kgBW/day)	Reference
4,4'-DDT (Continued)	Dog	Oral	NR	Reproductive		3540	RTECS, 1993
	Monkey	Oral	NR	Mortality	200		RTECS, 1993
	Chicken	Oral (subchronic)	10 weeks	Decreased reproductive success; toxic symptoms		91.4 ^a	USEPA, 1985
	Rock dove	Single oral dose		Mortality	4000		USFWS, 1984
	Black duck	Oral (chronic)	2 years	Reduced eggshell thickness		0.14 ^a	Longcore and Stendell, 1977
	Mallard	Single oral dose		Mortality	2240		USFWS, 1984
	Mallard	Oral (subchronic)	96 days	Reduced eggshell thickness		2.8	Longcore and Stendell, 1977
	Mallard	Oral	NR	Eggshell thinning		1.16	USEPA, 1993
	Mallard	Oral	NR	Eggshell thinning		2.91	USEPA, 1993
	Mallard	Oral	2 years	Reproductive		1.45	USEPA, 1993
	California quail	Single oral dose		Mortality	595		USFWS, 1984
	Japanese quail	Single oral dose		Mortality	841		USFWS, 1984
	Pheasant	Single oral dose		Mortality	1334		USFWS, 1984
	Sandhill crane	Single oral dose		Mortality	1200		USFWS, 1984
	Kestrel	Oral (chronic)	7 wk - 1 yr	Reduced eggshell thickness		0.56 ^a	USEPA, 1985
	Kestrel	Oral (chronic)	1 year	Reduced eggshell thickness		0.16 ^a	Wiemeyer, et al., 1986

Appendix F
Wildlife Toxicity Data
Baseline Risk Assessment
Zone A
Naval Base Charleston

Chemical	Test Species	Test Type	Duration	Effect	Oral LD ₅₀ (mg/kg/BW)	LOAEL (mg/kgBW/day)	Reference
4,4'-DDT (Continued)	Barn owl	Oral (chronic)	2 years	Reduced eggshell thickness		0.14 ^a	Longcore and Standell, 1977
Dieldrin	Mouse	Single oral dose	NR	Mortality	38		Allen et al., 1979
	Mouse	Oral (chronic)	80 weeks	Body tremors		0.33	ATSDR, 1992
	Rat	Single oral dose	NR	Mortality	46		Allen et al., 1979
	Guinea pig	Single oral dose	NR	Mortality	25		Allen et al., 1979
	Rabbit	Single oral dose	NR	Mortality	45		Allen et al., 1979
	House sparrow	Single oral dose	NR	Mortality	48		USFWS, 1984
	Chicken	Single oral dose	NR	Mortality	20		Allen et al., 1979
	Rock dove	Single oral dose	NR	Mortality	27		USFWS, 1984
	Gray partridge	Single oral dose	NR	Mortality	9		USFWS, 1984
	Chukar	Single oral dose	NR	Mortality	25		USFWS, 1984
	Japanese quail	Oral (acute)	5 days	Mortality	6 ^a		Hill et al., 1975
	Japanese quail	Single oral dose	NR	Mortality	70		USFWS, 1984
	California quail	Single oral dose	NR	Mortality	9		USFWS, 1984
	Bobwhite	Oral (acute)	5 days	Mortality	3 ^a		Hill et al., 1975
	Pheasant	Single oral dose	NR	Mortality	79		USFWS, 1984
	Mallard	Oral (acute)	5 days	Mortality	12 ^a		Hill et al., 1975
	Mallard	Oral (acute)	5 days	Mortality	11 ^a		Hill et al., 1975
	Mallard	Single oral dose	NR	Mortality	381		USFWS, 1984

Appendix F
Wildlife Toxicity Data
Baseline Risk Assessment
Zone A
Naval Base Charleston

Chemical	Test Species	Test Type	Duration	Effect	Oral LD ₅₀ (mg/kg/BW)	LOAEL (mg/kgBW/day)	Reference
Dieldrin	Whistling duck	Single oral dose	NR	Mortality	100		USFWS, 1984
	Canada goose	Single oral dose	NR	Mortality	141		USFWS, 1984
	Goat	Single oral dose	NR	Mortality	100		Allen et al., 1979
	Sheep	Single oral dose	NR	Mortality	50		Allen et al., 1979
	Cattle	Single oral dose	NR	Mortality	60		Allen et al., 1979
	Mule deer	Single oral dose	NR	Mortality	75		Allen et al., 1979
	Cat	Single oral dose	NR	Mortality	300		Allen et al., 1979
	Dog	Single oral dose	NR	Mortality	65		Allen et al., 1979
Endosulfan	Mouse	Oral (chronic)	78 weeks	Mortality		0.9	ATSDR, 1991
	Mouse	Oral (chronic)	78 weeks	Ovarian cyst development		0.26	ATSDR, 1991
	Rat	Single oral dose	NR	Mortality	24		ATSDR, 1991
	Rat	Oral (chronic)	2 years	Reduced testes weight		10	USEPA, 1980
	Mallard	Single oral dose	NR	Mortality	33		USFWS, 1984
	Mallard	Single oral dose	NR	Mortality	31.2		USFWS, 1984
	Pheasant	Single oral dose	NR	Mortality	80		USFWS, 1984
Endrin	Mouse	Oral (chronic)	80 weeks	Mortality		0.53	ATSDR, 1990
	Dog	Oral (chronic)	19 months	Decreased weight gain		0.1	USEPA, 1985
2,3,7,8-TCDD	Northern Bobwhite	Single oral dose	NR	Mortality	.015		Hudson et al., 1984
	Ringed Turtle Dove	Single oral dose	NR	Mortality	.810		Hudson et al., 1984

Appendix F
Wildlife Toxicity Data
Baseline Risk Assessment
Zone A
Naval Base Charleston

Chemical	Test Species	Test Type	Duration	Effect	Oral LD ₅₀ (mg/kg/BW)	LOAEL (mg/kgBW/day)	Reference
2,3,7,8-TCDD (Continued)	Mallards	Single oral dose	NR	Mortality	.108		Hudson et al., 1984
	Chicken	Single oral dose	NR	Mortality	.037		Kociba & Schwetz, 1982
	Guinea pig	Oral	NR	Mortality	.002		Kociba & Schwetz, 1982
	Mouse	Oral	NR	Mortality	.284		Kociba & Schwetz, 1982
	Guinea Pig	Single oral dose	NR	Mortality	.0006		Harless et al., 1982
	Rat	Single oral dose	NR	Mortality	.022		Kociba & Schwetz, 1982
	Monkey	Single oral dose	NR	Mortality	.070		Olson et al., 1980
	Dog	Single oral dose	NR	Mortality	.1		Kociba & Schwetz, 1982
	Mouse	Single oral dose	NR	Mortality	.114		Kociba & Schwetz, 1982
	Rabbit	Single oral dose	NR	Mortality	.115		Olson et al., 1980
	Hamster	Single oral dose	NR	Mortality	1.157		Kociba & Schwetz, 1982
	Rat	Oral (chronic)	NR	Reproductive effects		1.0E-05	McNulty, 1977
	Monkey	Oral (chronic)	NR	Reproductive effects		1.7E-06	Ramel, 1978
	Chicken	Oral (chronic)	21 days	Chick liver disease		.001	NRCC 1981

Appendix F
Wildlife Toxicity Data
Baseline Risk Assessment
Zone A
Naval Base Charleston

Chemical	Test Species	Test Type	Duration	Effect	Oral LD ₅₀ (mg/kg/BW)	LOAEL (mg/kgBW/day)	Reference
Inorganics							
Aluminum	Mouse	Oral	2-3 genrtns	Reduced bodyweight gain of newborns		425	NIOSH, 1985
	Rat	Oral	15 days	Reduced growth		100	Bernuzzi, et al., 1989
Arsenic	Rat	Oral	NR	Reproductive effects		0.61	RTECS, 1993
	Rat	Oral	NR	Reproductive effects		0.58	RTECS, 1993
	Rat	Oral	NR	Mortality	763		RTECS, 1993
	Mouse	Oral	NR	Mortality	145		RTECS, 1993
Beryllium	Rat	Single oral dose	NR	Mortality	10		USEPA, 1985
Cadmium	Rat	Oral	NR	Reproductive effects		155	RTECS, 1993
	Rat	Oral	NR	Reproductive effects		220	RTECS, 1993
	Rat	Oral	NR	Reproductive effects		21.5	RTECS, 1993
	Rat	Oral	NR	Reproductive effects		23	RTECS, 1993
	Rat	Single oral dose		Mortality	250		Eisler, 1985
	Rat	Oral	NR	Mortality	225		RTECS, 1993
	Mouse	Oral	NR	Mortality	890		RTECS, 1993
	Mouse	Oral	NR	Reproductive effects		448	RTECS, 1993
	Mouse	Oral	NR	Reproductive effects		1700	RTECS, 1993
	Guinea pig	Single oral dose		Mortality	150		Eisler, 1985
	Mallard	Oral (subchronic)	90 days	Egg production suppressed		10	Eisler, 1985

Appendix F
Wildlife Toxicity Data
Baseline Risk Assessment
Zone A
Naval Base Charleston

Chemical	Test Species	Test Type	Duration	Effect	Oral LD ₅₀ (mg/kg/BW)	LOAEL (mg/kgBW/day)	Reference
Chromium (Potassium dichromate)	Japanese quail	Oral (acute)	5 days	Mortality	126		Hill and Camardese, 1986
Copper	Rat	Single oral dose		Reproductive effects		152	NIOSH, 1985 and RTECS, 1993
	Mallard	Oral (subchronic)	29 days	NOAEL for survivorship		10.5 ^b	Demayo et al., 1982
Iron	Rat	Single oral dose	NR	Mortality	319		Sax, 1984
	Mouse	Single oral dose	NR	Mortality	979		Sax, 1984
	Guinea pig	Single oral dose	NR	Mortality	1200		Sax, 1984
Lead	Rat	Oral	NR	Reproductive effects		790	RTECS, 1993
	Rat	Oral	NR	Reproductive effects		1140	RTECS, 1993
	Rat	Oral	NR	Reproductive effects		520	RTECS, 1993
	Rat	Oral	NR	Reproductive effects		1100	RTECS, 1993
	Calf	Single oral dose	NR	Mortality	220		Eisler, 1988
	Mouse	Oral	NR	Reproductive effects		1120	RTECS, 1993
	Mouse	Oral	NR	Reproductive effects		6300	RTECS, 1993
	Mouse	Oral	NR	Reproductive effects		300	RTECS, 1993
	Mouse	Oral	NR	Reproductive effects		4800	RTECS, 1993
	Domestic animal	Oral	NR	Reproductive effects		662	RTECS, 1993
	Mammal	Oral	NR	Reproductive effects		2118	RTECS, 1993
	Kestrel	Diet	NR	Decreased egg laying fertility; decreased egg shell thickness		250 ^b	Eisler, 1988

Appendix F
Wildlife Toxicity Data
Baseline Risk Assessment
Zone A
Naval Base Charleston

Chemical	Test Species	Test Type	Duration	Effect	Oral LD ₅₀ (mg/kg/BW)	LOAEL (mg/kgBW/day)	Reference
Lead	Nestlings	Oral	NR	Reduced growth and brain weight; abnormal development		125	Eisler, 1988
	Japanese quail	Diet	5 days	Mortality	24752		Hill and Camardese, 1986
Manganese	Mouse	Oral (subchronic)	90 days	Delayed growth of testes		140	ATSDR, 1990
	Mouse	Oral (chronic)	103 weeks	Mortality		4050	ATSDR, 1990
	Rat	Single oral dose	NR	Mortality	410		ATSDR, 1990
	Rat	Oral (acute)	20 days	Mortality	225		ATSDR, 1990
	Rat	Oral (subchronic)	20 days	Decreased litter weight during gestation		3100 ^b	ATSDR, 1990
	Rat	Oral (chronic)	103 weeks	Mortality		930	ATSDR, 1990
	Guinea pig	Single oral dose	NR	Mortality	400		USEPA, 1984
	Monkey	Oral (chronic)	18 months	Weakness, rigidity		25	ATSDR, 1990
Mercury	Mouse	Single oral dose		Mortality	22		NIOSH, 1985
	Rat	Oral (chronic)	NR	Reduced fertility		0.5	Eisler, 1987
	Rat	Single oral dose		Mortality	18		NIOSH, 1985
	Pig	Oral (subchronic)	Pregnancy	High incidence of stillbirths		0.5	Eisler, 1987
	Mule deer	Single oral dose		Mortality	17.9		Eisler, 1987
	River otter	Single oral dose		Mortality	2		Eisler, 1987
	Mink	Single oral dose		Mortality	1		Eisler, 1987

Appendix F
Wildlife Toxicity Data
Baseline Risk Assessment
Zone A
Naval Base Charleston

Chemical	Test Species	Test Type	Duration	Effect	Oral LD ₅₀ (mg/kg/BW)	LOAEL (mg/kgBW/day)	Reference
Mercury (Continued)	Dog	Oral (subchronic)	Pregnancy	High incidence of stillbirths		0.1	Eisler, 1987
	House sparrow	Single oral dose		Mortality	12.6		Eisler, 1987
	Rock dove	Single oral dose		Mortality	22.8		Eisler, 1987
	Chicken	Single oral dose		Mortality	20		Fimreite, 1979
	Bantam chicken	Single oral dose		Mortality	190		Fimreite, 1979
	Prairie chicken	Single oral dose		Mortality	11.5		Eisler, 1987
	Chukar	Single oral dose		Mortality	26.9		Eisler, 1987
	Corturnix	Single oral dose		Mortality	11		Eisler, 1987
	Mallard	Oral	NR	Reproduction, behavior		0.064	USEPA, 1993
	Black duck	Oral (subchronic)	28 weeks	Reproduction inhibited		0.22 ^a	Eisler, 1987
	Fulvous whistling duck	Single oral dose		Mortality	37.8		Eisler, 1987
	Northern bobwhite	Single oral dose		Mortality	23.8		Eisler, 1987
	Bobwhite quail	Oral (acute)	5 days	Mortality	523		Hill et al., 1975
	Japanese quail	Single oral dose		Mortality	14.4		Eisler, 1987
	Gray partridge	Single oral dose		Mortality	17.6		Eisler, 1987
	Gray pheasant	Oral (subchronic)	30 days	Reduced reproductive ability		0.64	Eisler, 1987
	Ring-necked pheasant	Single oral dose		Mortality	11.5		Eisler, 1987
Nickel	Rat	Oral	NR	Reproductive effects		158	RTECS, 1994
	Rat	Single oral dose	NR	Mortality	67		ATSDR, 1987

Appendix F
Wildlife Toxicity Data
Baseline Risk Assessment
Zone A
Naval Base Charleston

Chemical	Test Species	Test Type	Duration	Effect	Oral LD ₅₀ (mg/kg/BW)	LOAEL (mg/kgBW/day)	Reference
Selenium	Rat	Oral	NR	Mortality	6700		RTECS, 1993
	Mouse	Oral	NR	Reproductive effects		134	RTECS, 1993
	Mallard	Oral (subchronic)	3 months	Reduced hatchability		1.75	Eisler, 1985
Vanadium	Japanese quail	Oral (acute)	5 days	Mortality	96		Hill and Cemaradese, 1986
Zinc	Rat	Single oral dose		Mortality	2510		RTECS, 1993
	Rat	Oral (subchronic)	NR	Kidney toxicity		160	Llobet, et al., 1988

Notes:

LD50 = Dose resulting in 50% mortality in test population.

BW = Body weight.

LOAEL = Lowest Observed Adverse Effect Level.

NR = Not reported.

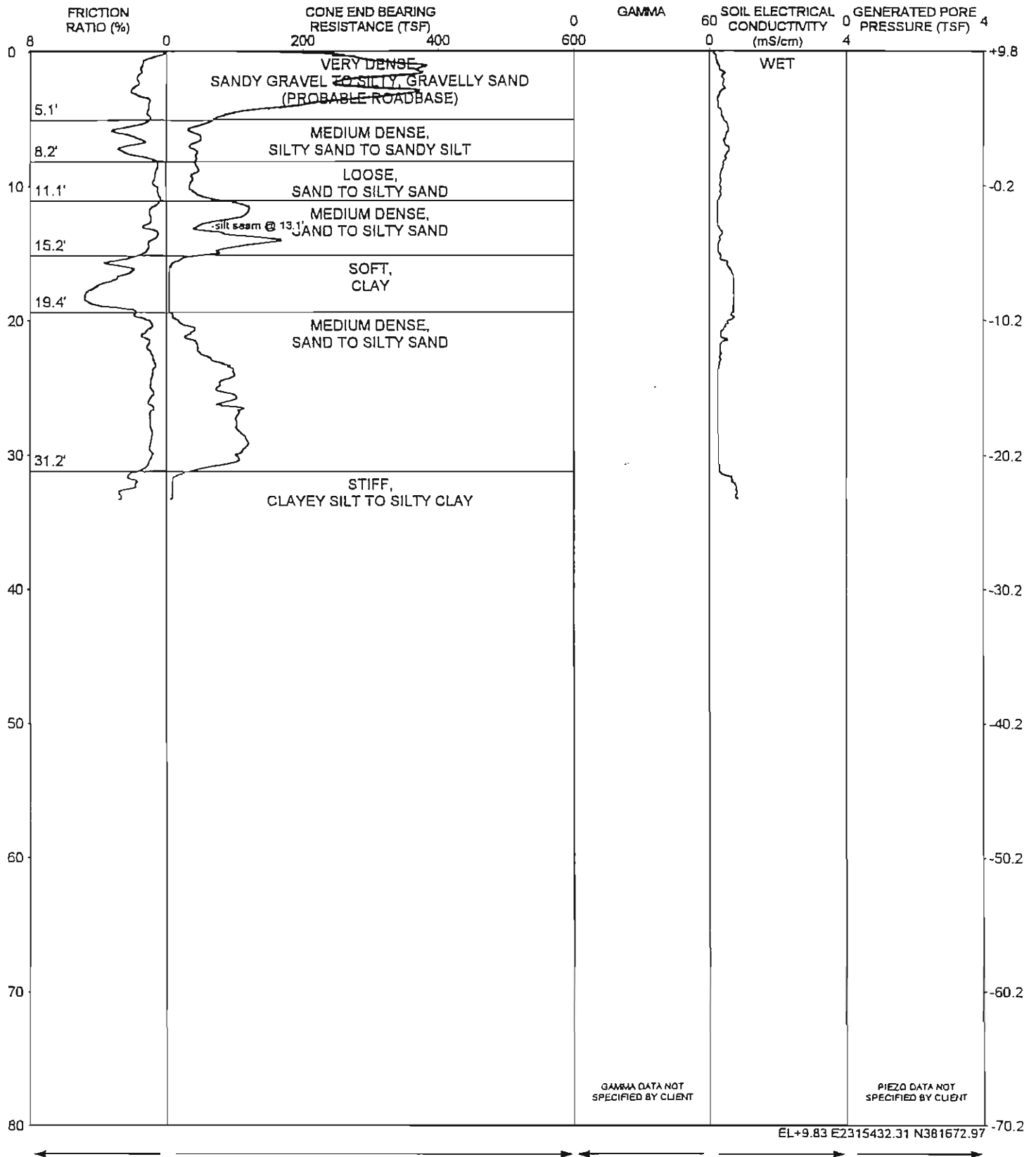
a = Converted to dose per kilogram body weight by multiplying by ingestion and dividing by body weight.

b = Estimated by applying a LOAEL-NOAEL ratio of 5 (Newell et al., 1987).

Appendix G

Cone Penetrometer Logs

INTERPRETED CPT-EC LOG

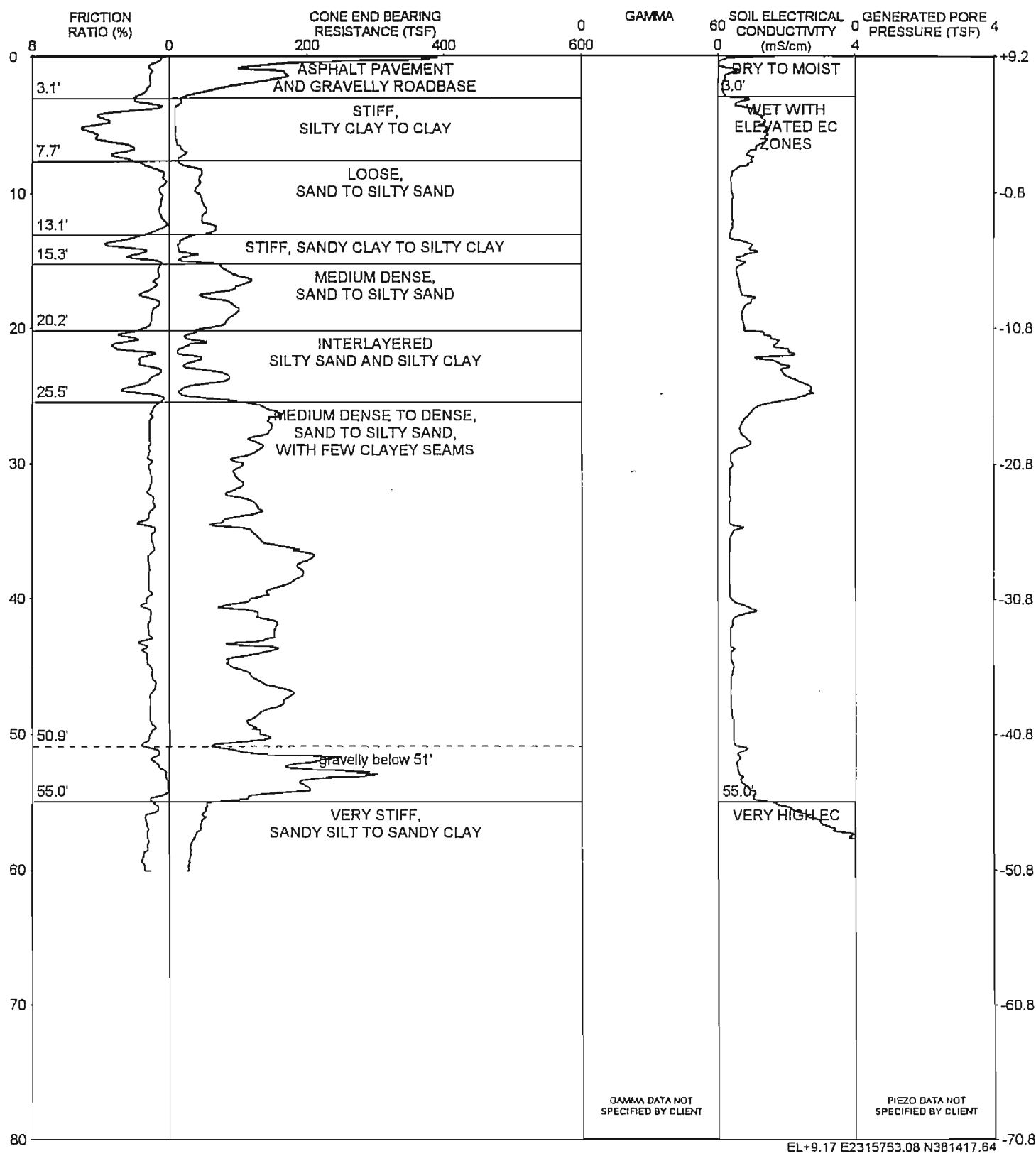


STRATIGRAPHICS

PROJECT NAME: Zone A Charleston Naval Base, S.C.
PROJECT NUMBER: 96-110-230

DATE: 09/13/96
SOUNDING NUMBER: CP001

INTERPRETED CPT-EC LOG

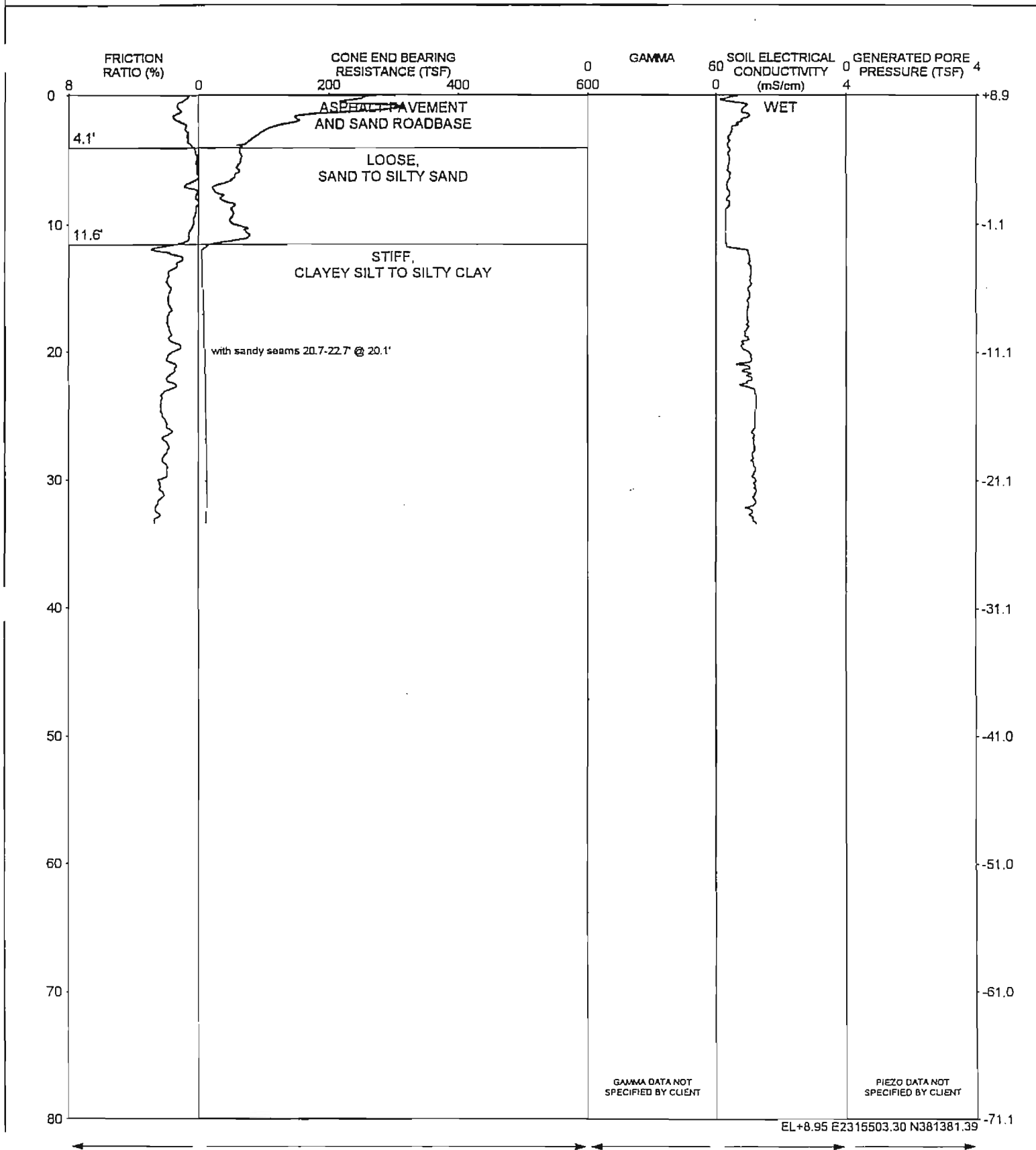


STRATIGRAPHICS

PROJECT NAME: Zone A Charleston Naval Base, S.C.
PROJECT NUMBER: 96-110-230

DATE: 09/13/96
SOUNDING NUMBER: CP002

INTERPRETED CPT-EC LOG

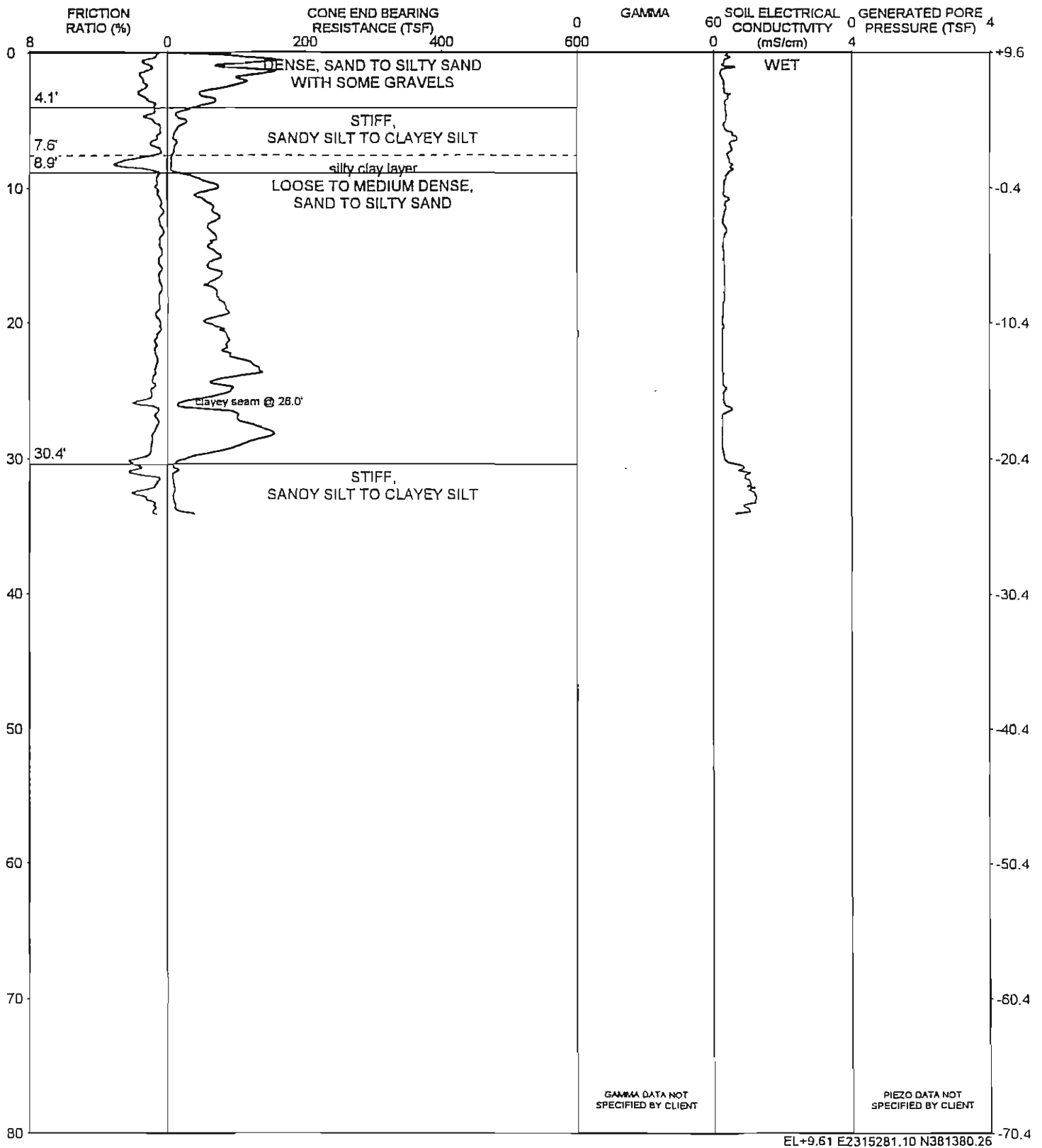


STRATIGRAPHICS

PROJECT NAME: Zone A Charleston Naval Base, S.C.
PROJECT NUMBER: 96-110-230

DATE: 09/13/96
SOUNDING NUMBER: CP003

INTERPRETED CPT-EC LOG

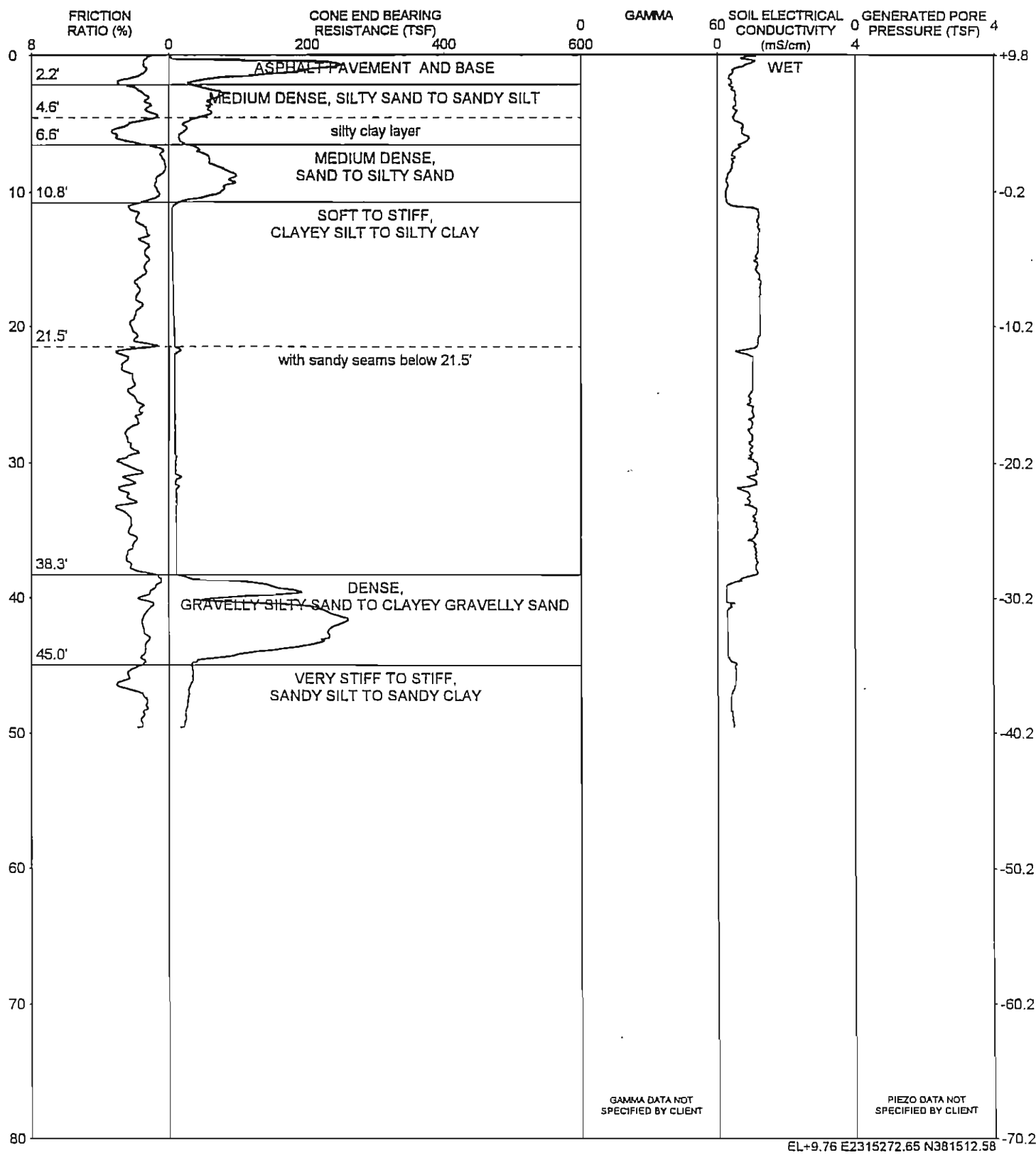


STRATIGRAPHICS

PROJECT NAME: Zone A Charleston Naval Base, S.C.
PROJECT NUMBER: 96-110-230

DATE: 09/14/96
SOUNDING NUMBER: CP004

INTERPRETED CPT-EC LOG

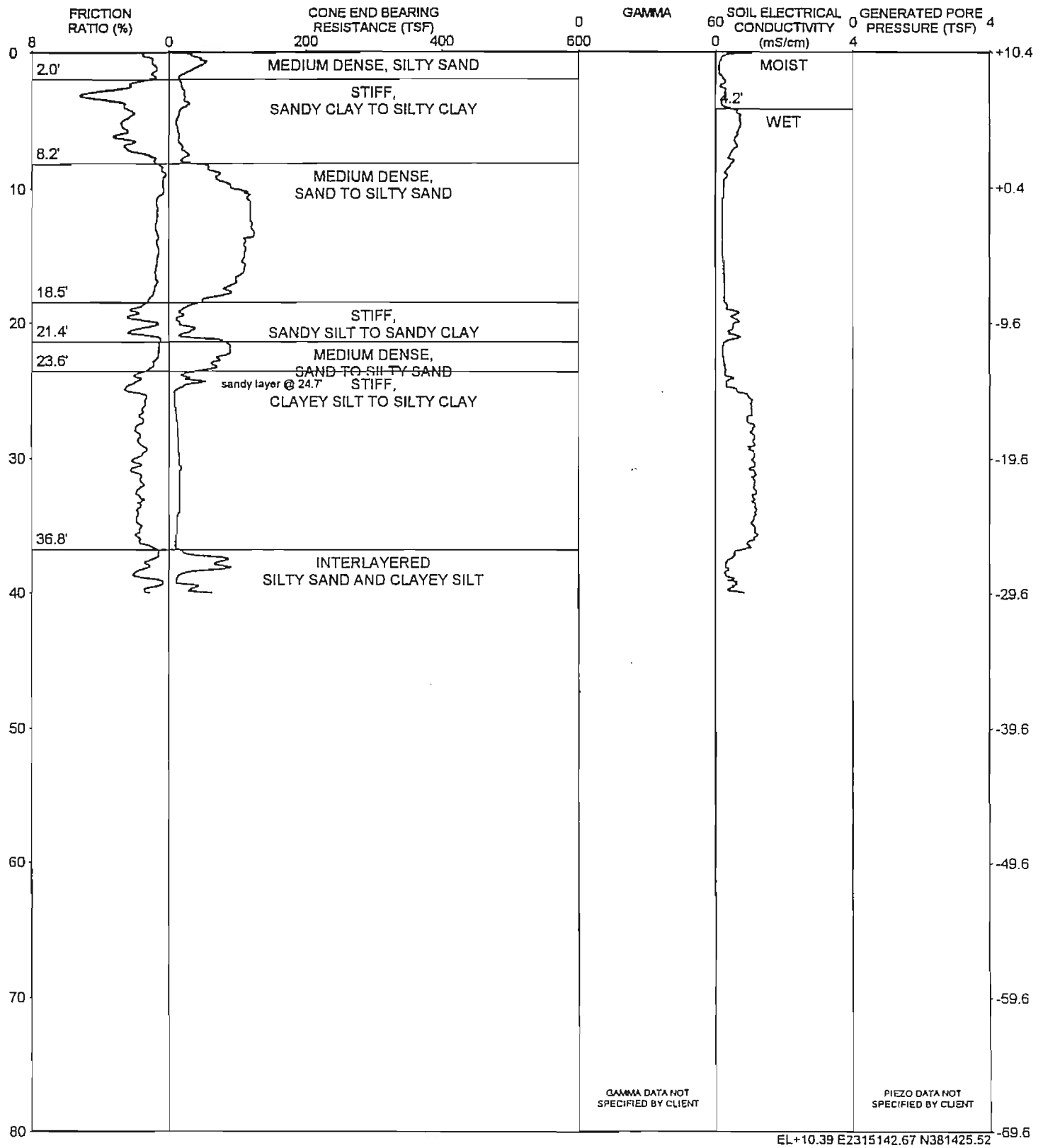


STRATIGRAPHICS

PROJECT NAME: Zone A Charleston Naval Base, S.C.
PROJECT NUMBER: 96-110-230

DATE: 09/14/96
SOUNDING NUMBER: CP005

INTERPRETED CPT-EC LOG

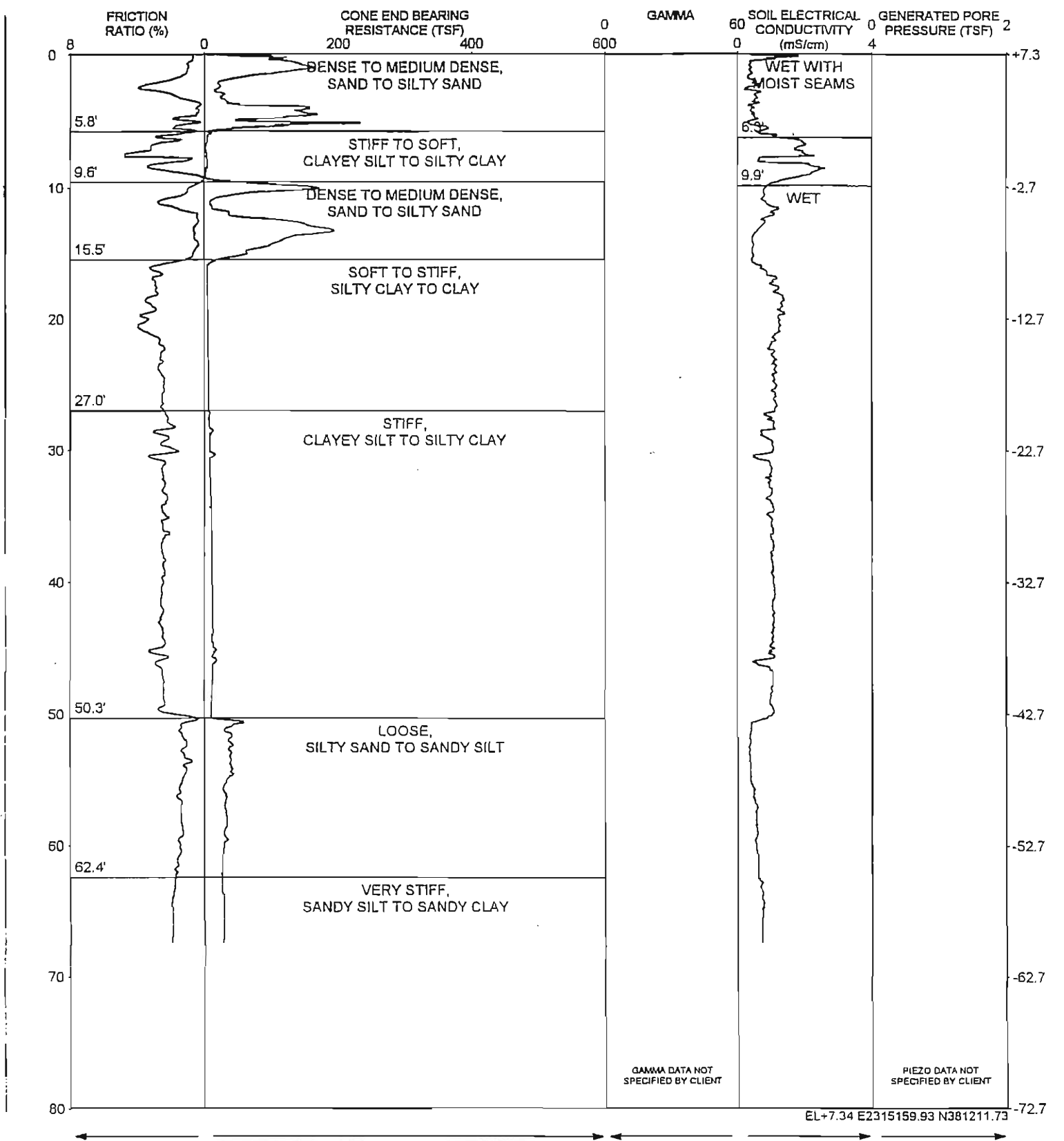


STRATIGRAPHICS

PROJECT NAME: Zone A Charleston Naval Base, S.C.
PROJECT NUMBER: 96-110-230

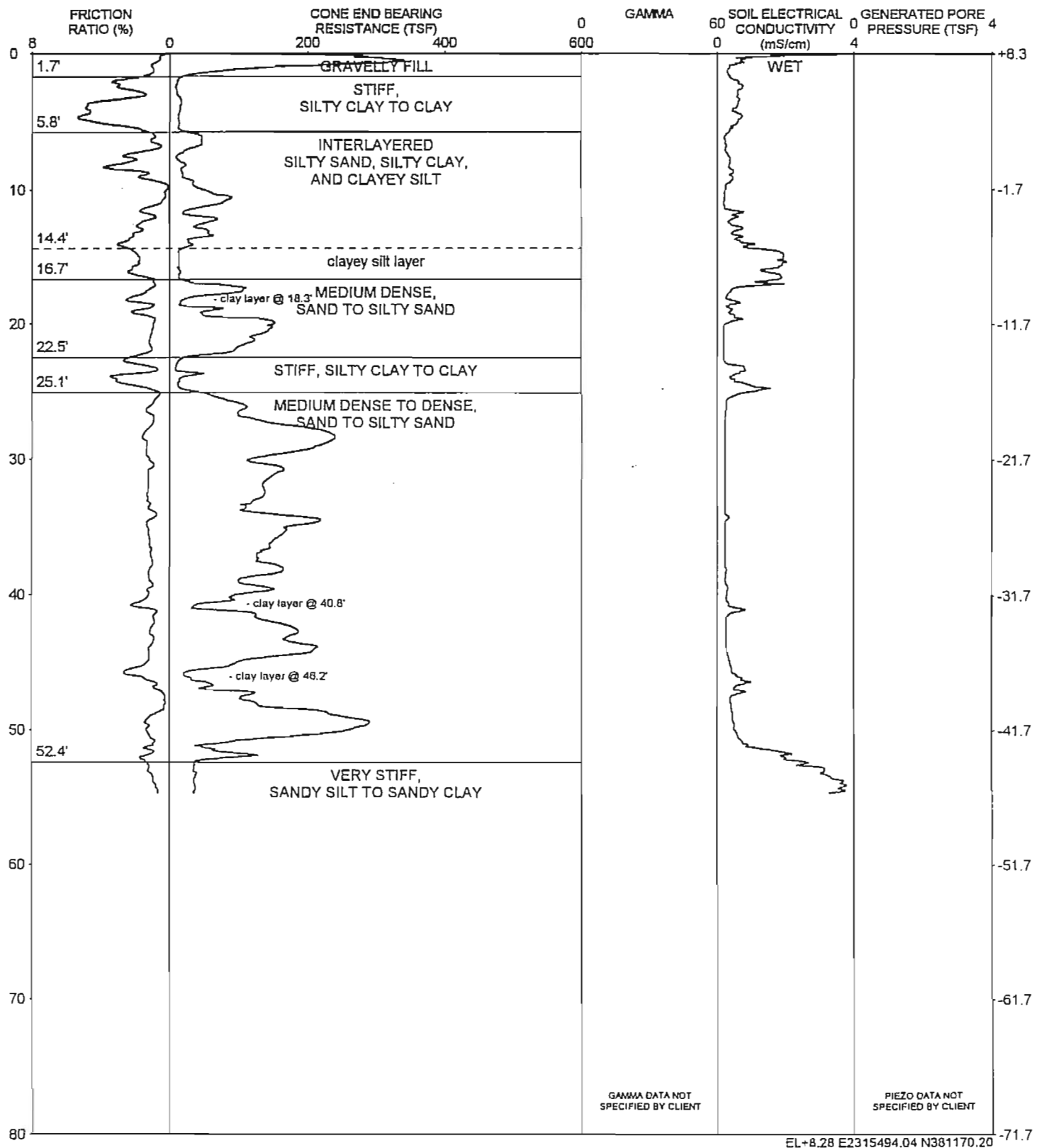
DATE: 09/14/96
SOUNDING NUMBER: CP006

INTERPRETED CPT-EC LOG



STRATIGRAPHICS

INTERPRETED CPT-EC LOG

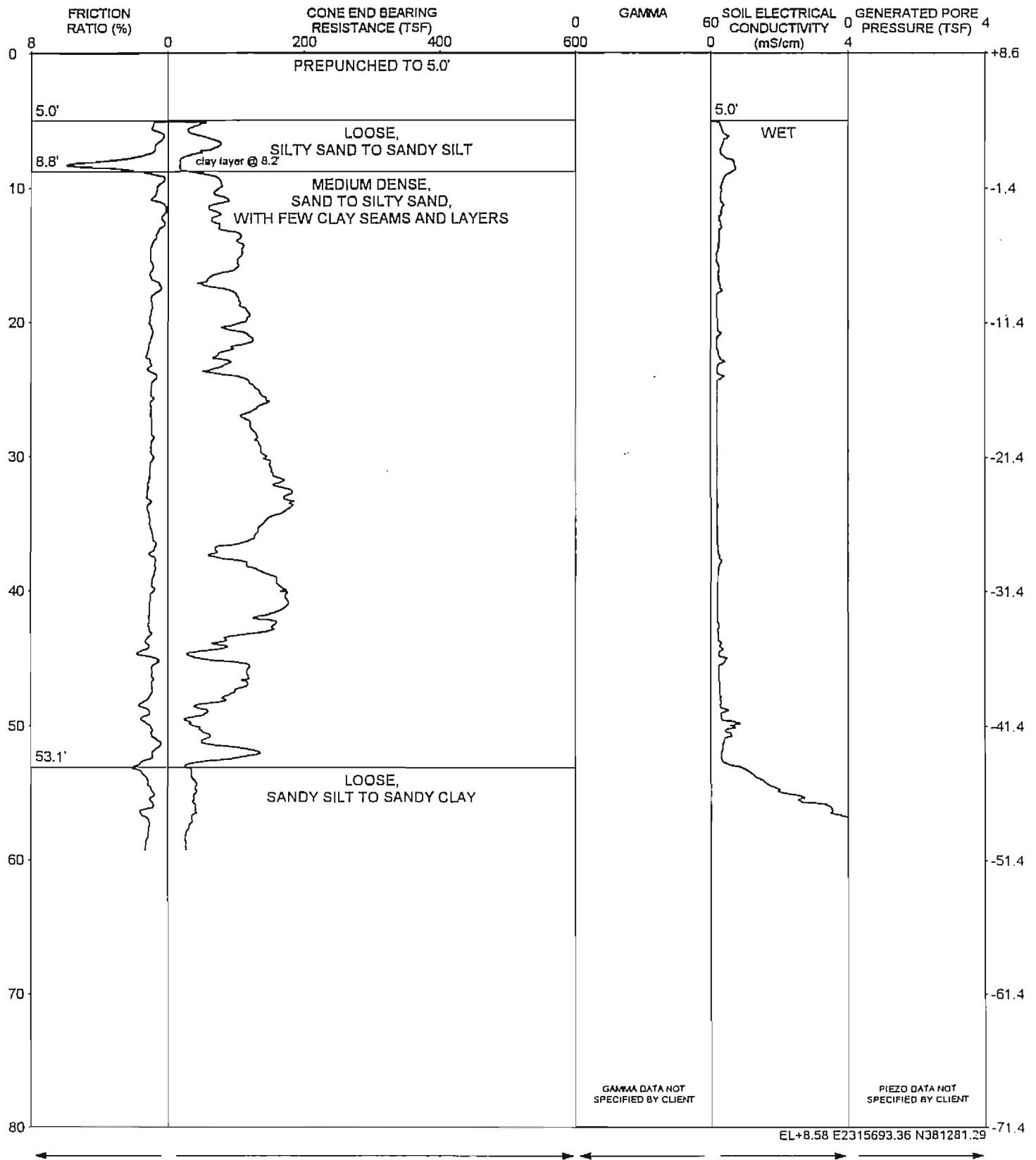


STRATIGRAPHICS

PROJECT NAME: Zone A Charleston Naval Base, S.C.
PROJECT NUMBER: 96-110-230

DATE: 09/14/96
SOUNDING NUMBER: CP008

INTERPRETED CPT-EC LOG

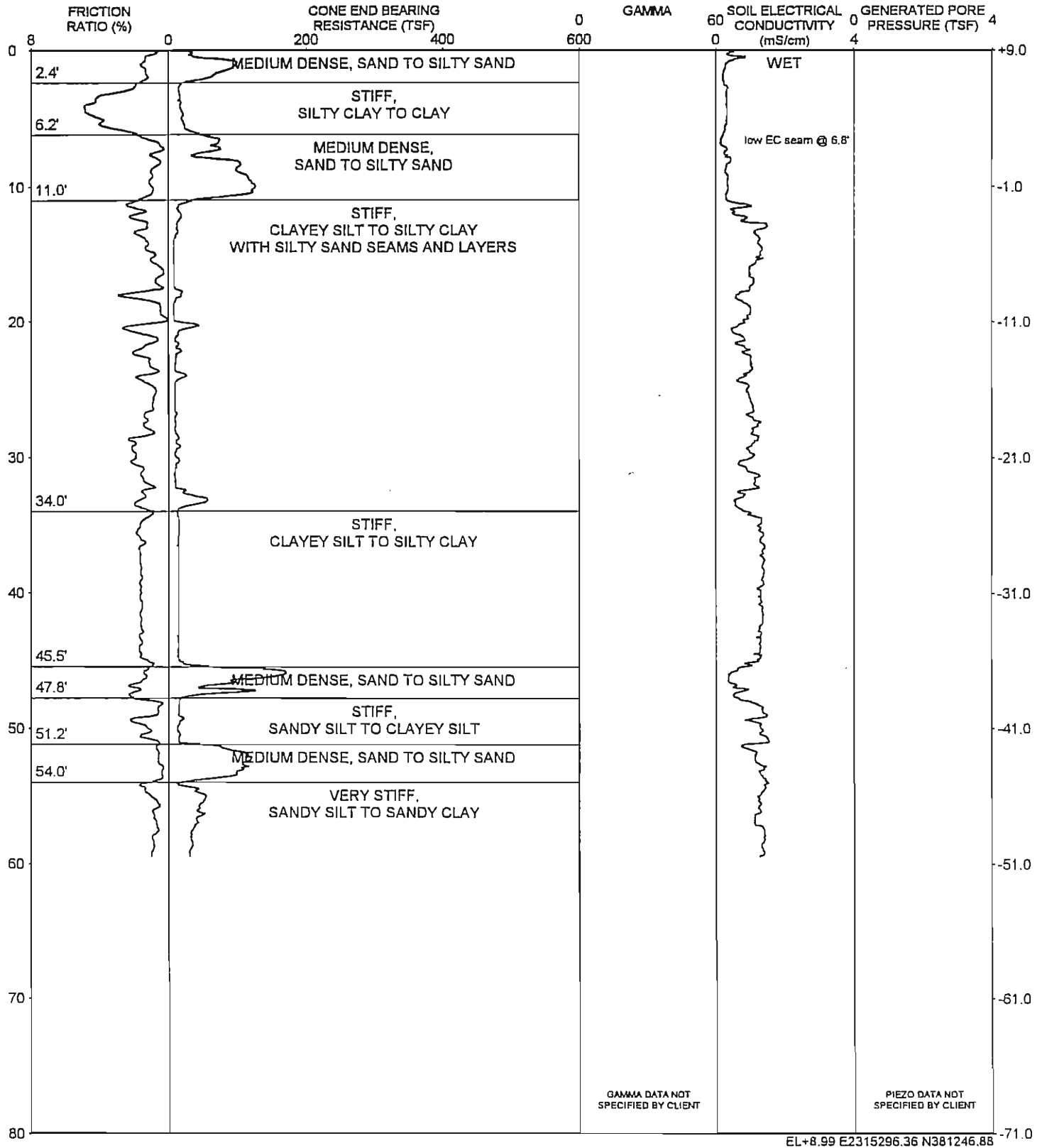


STRATIGRAPHICS

PROJECT NAME: Zone A Charleston Naval Base, S.C.
PROJECT NUMBER: 96-110-230

DATE: 09/14/96
SOUNDING NUMBER: CP009

INTERPRETED CPT-EC LOG

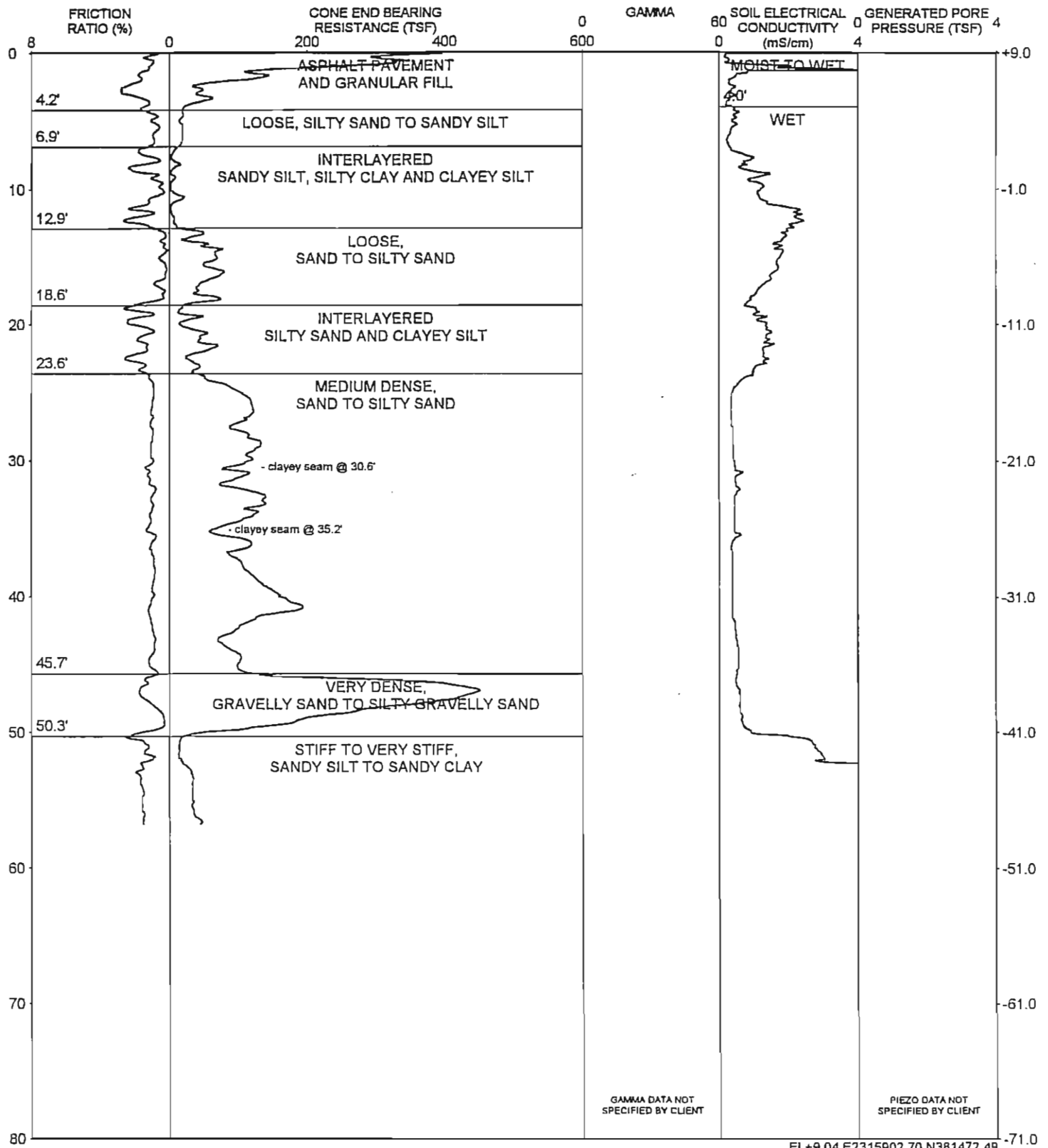


STRATIGRAPHICS

PROJECT NAME: Zone A Charleston Naval Base, S.C.
PROJECT NUMBER: 96-110-230

DATE: 09/14/96
SOUNDING NUMBER: CP010

INTERPRETED CPT-EC LOG

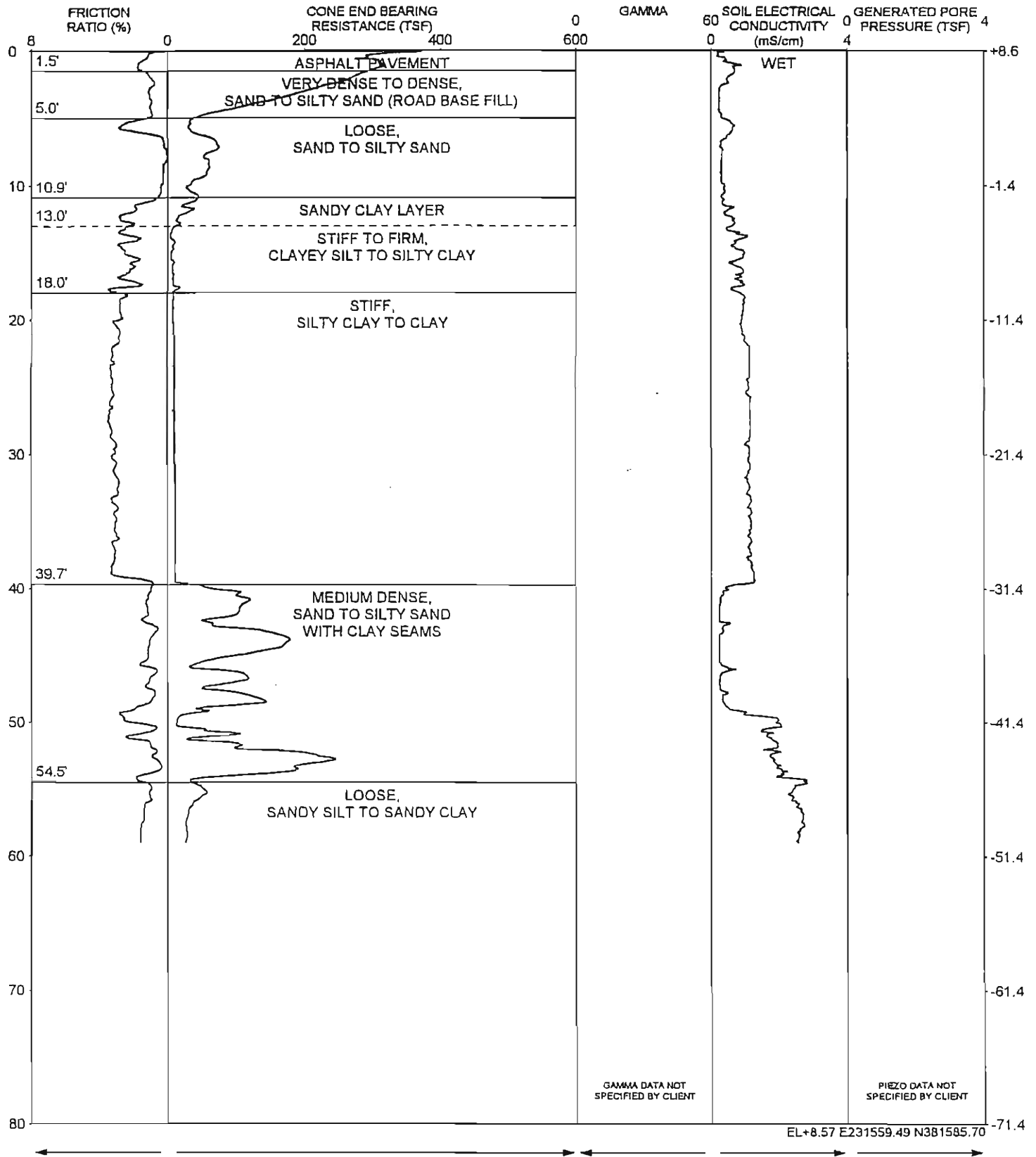


STRATIGRAPHICS

PROJECT NAME: Zone A Charleston Naval Base, S.C.
PROJECT NUMBER: 96-110-230

DATE: 09/14/96
SOUNDING NUMBER: CP011

INTERPRETED CPT-EC LOG

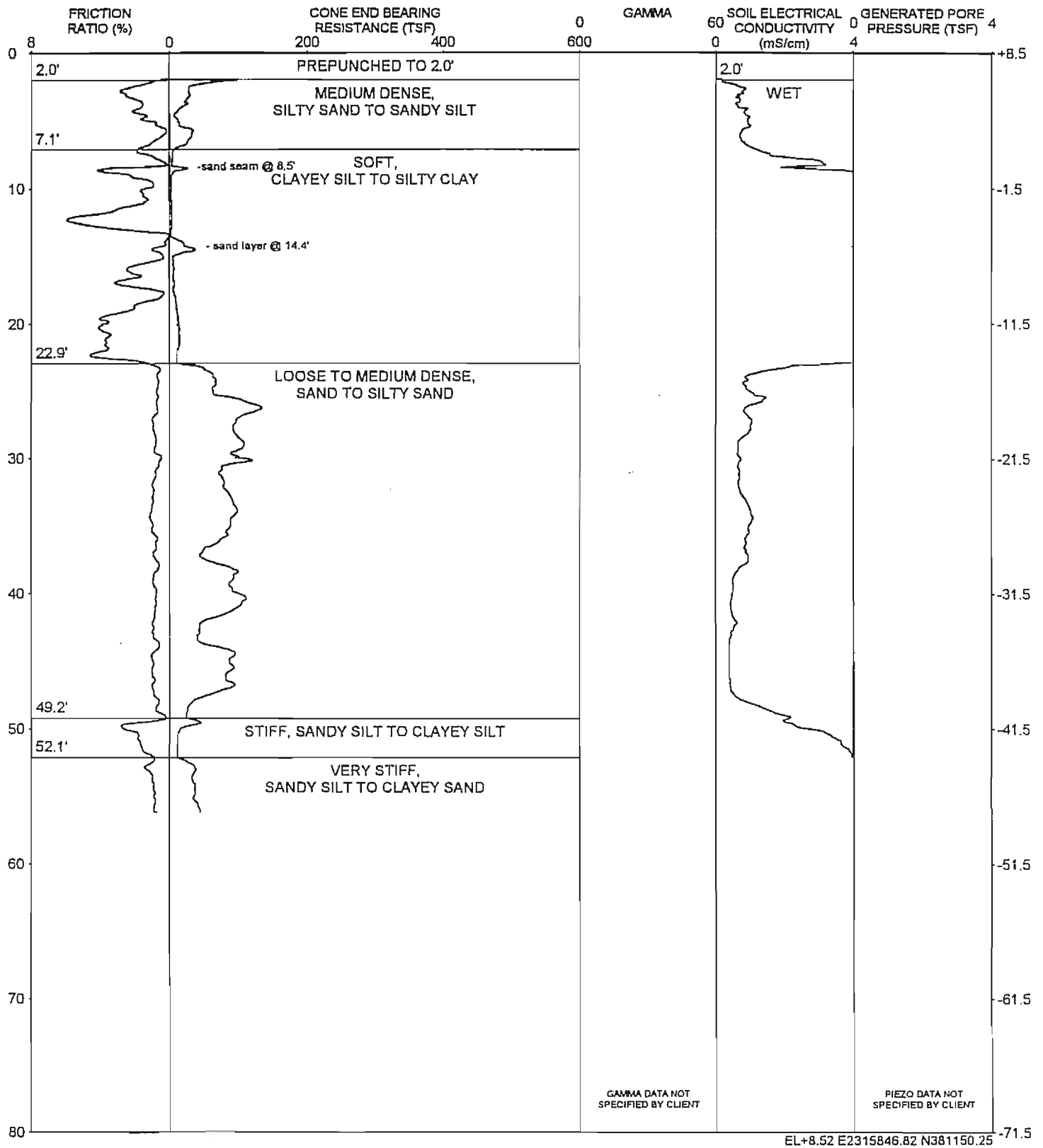


STRATIGRAPHICS

PROJECT NAME: Zone A Charleston Naval Base, S.C.
PROJECT NUMBER: 96-110-230

DATE: 09/14/96
SOUNDING NUMBER: CP012

INTERPRETED CPT-EC LOG

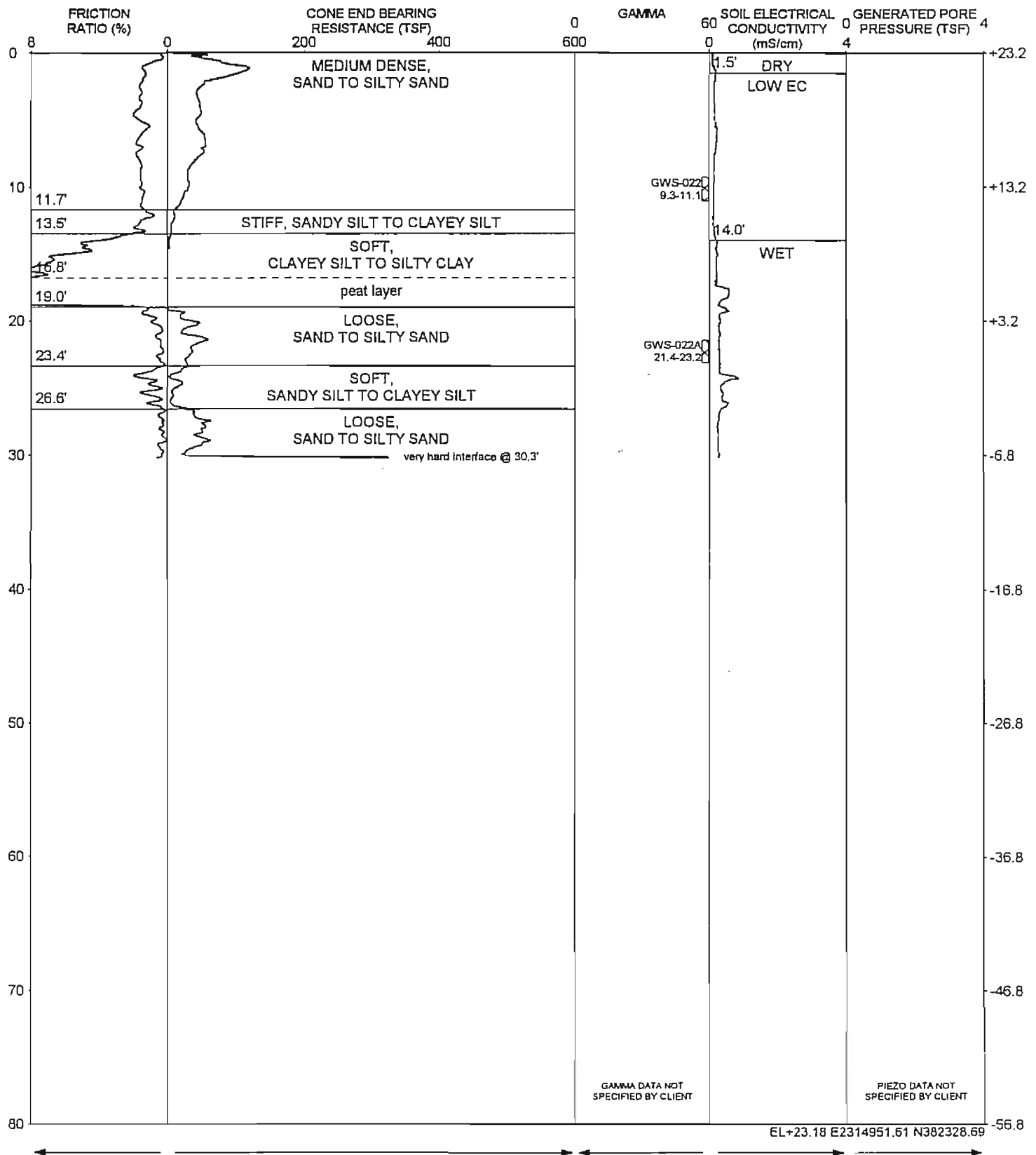


STRATIGRAPHICS

PROJECT NAME: Zone A Charleston Naval Base, S.C.
PROJECT NUMBER: 96-110-230

DATE: 09/14/96
SOUNDING NUMBER: CP013

INTERPRETED CPT-EC LOG

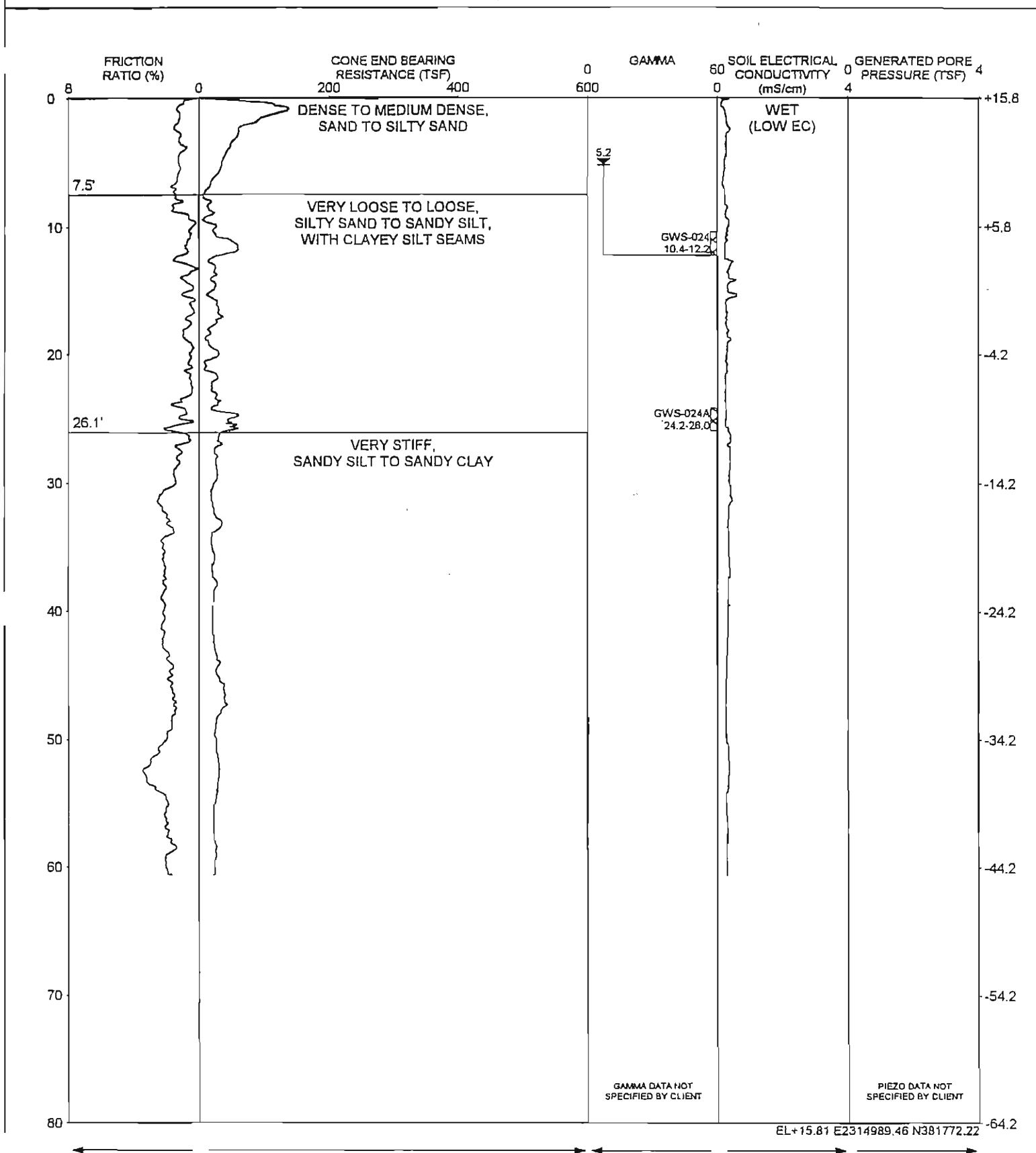


STRATIGRAPHICS

PROJECT NAME: Zone A Charleston Naval Base, S.C.
PROJECT NUMBER: 96-110-230

DATE: 09/26/96
SOUNDING NUMBER: CP022

INTERPRETED CPT-EC LOG

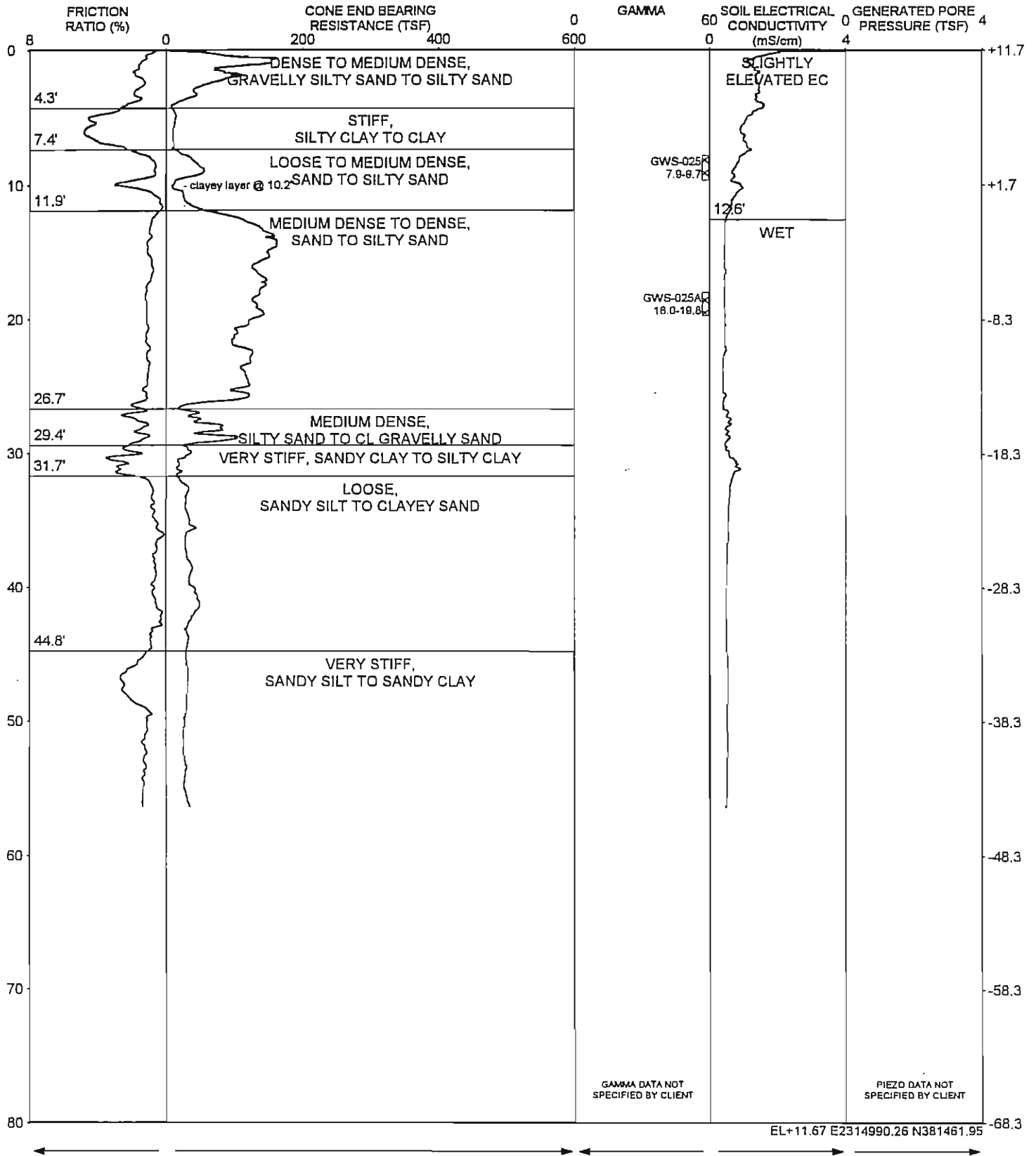


STRATIGRAPHICS

PROJECT NAME: Zone A Charleston Naval Base, S.C.
PROJECT NUMBER: 96-110-230

DATE: 09/25/96
SOUNDING NUMBER: CP024

INTERPRETED CPT-EC LOG

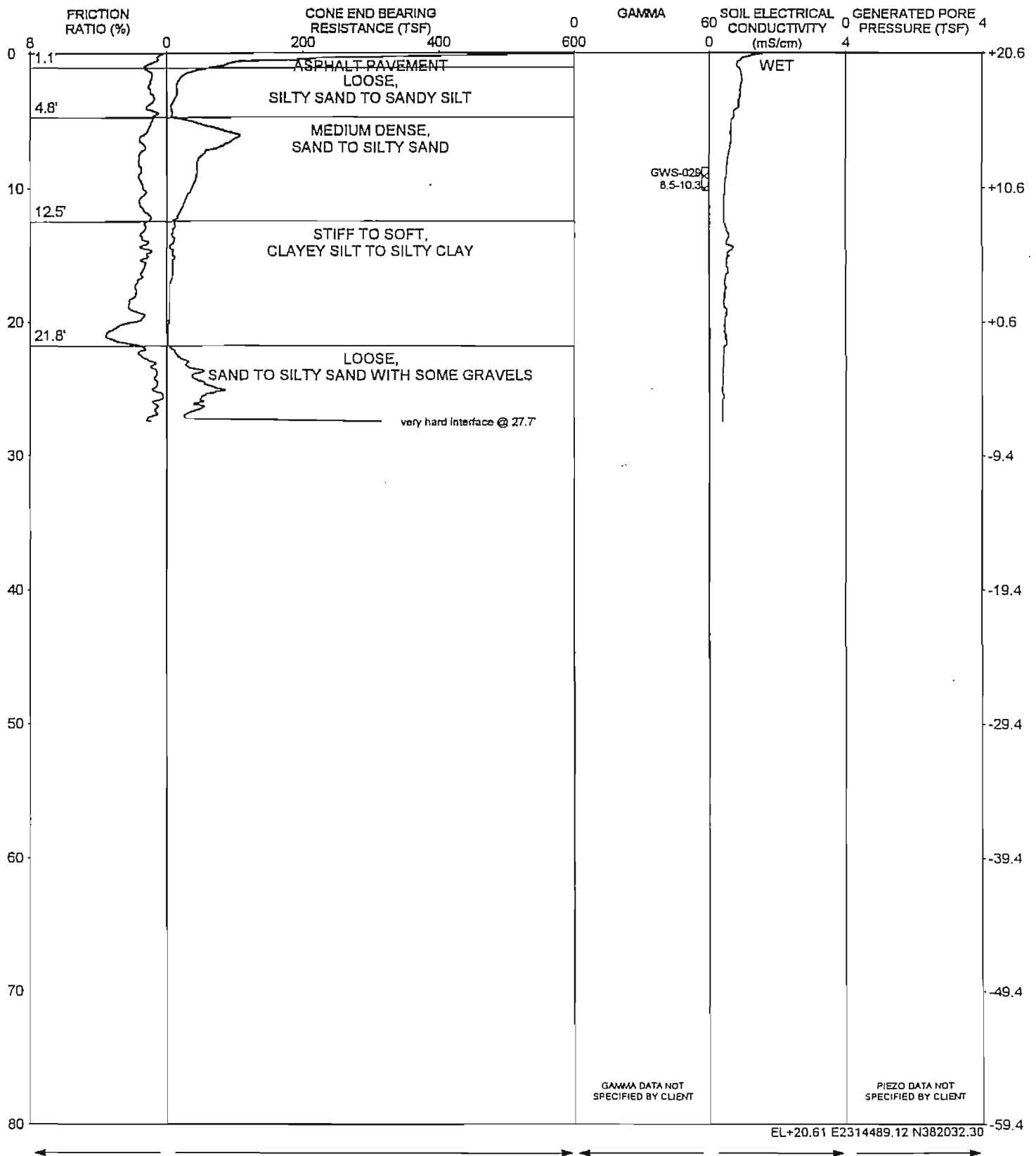


STRATIGRAPHICS

PROJECT NAME: Zone A Charleston Naval Base, S.C.
PROJECT NUMBER: 96-110-230

DATE: 09/27/96
SOUNDING NUMBER: CP025

INTERPRETED CPT-EC LOG

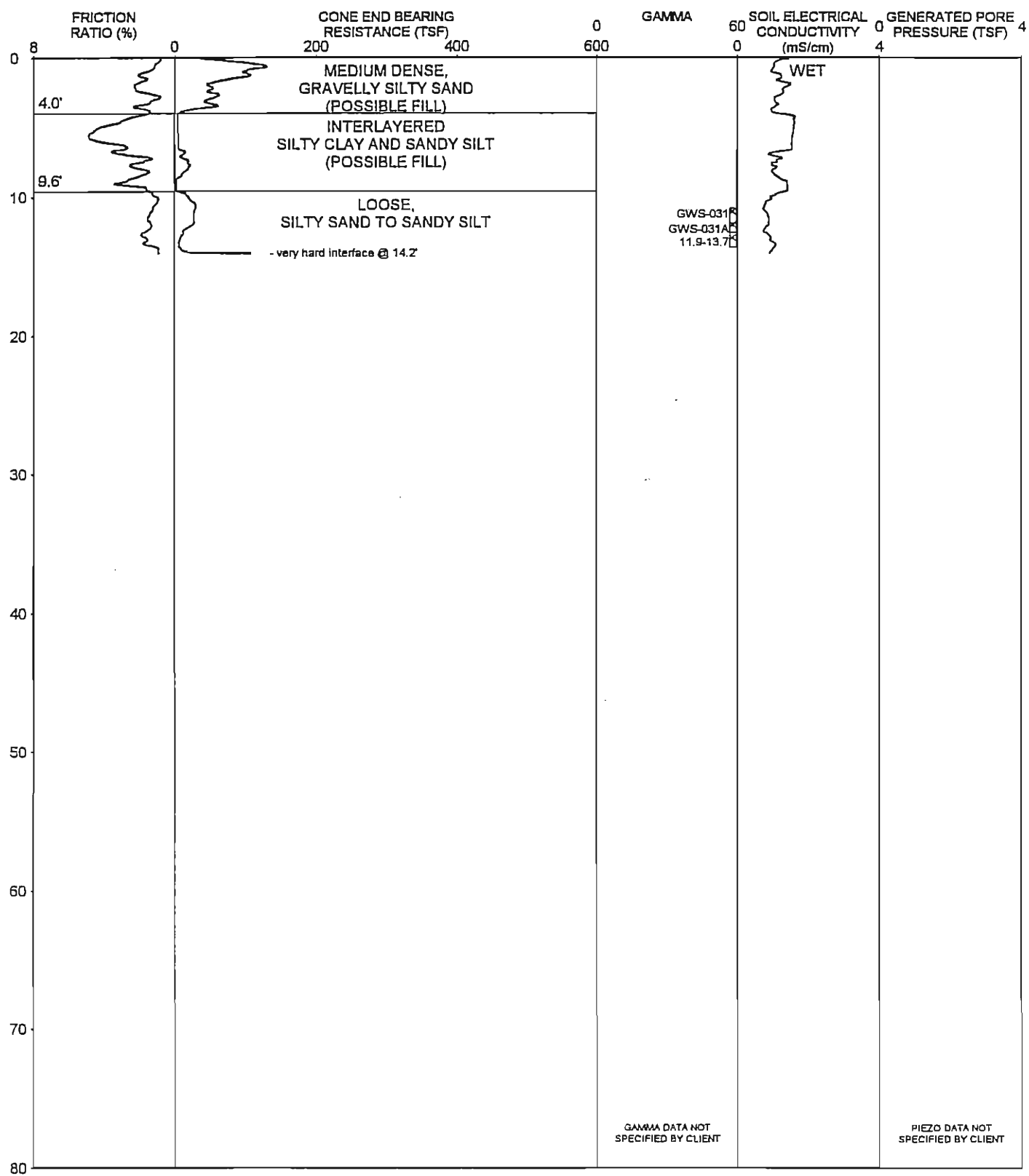


STRATIGRAPHICS

PROJECT NAME: Zone A Charleston Naval Base, S.C.
PROJECT NUMBER: 96-110-230

DATE: 09/26/96
SOUNDING NUMBER: CP029

INTERPRETED CPT-EC LOG

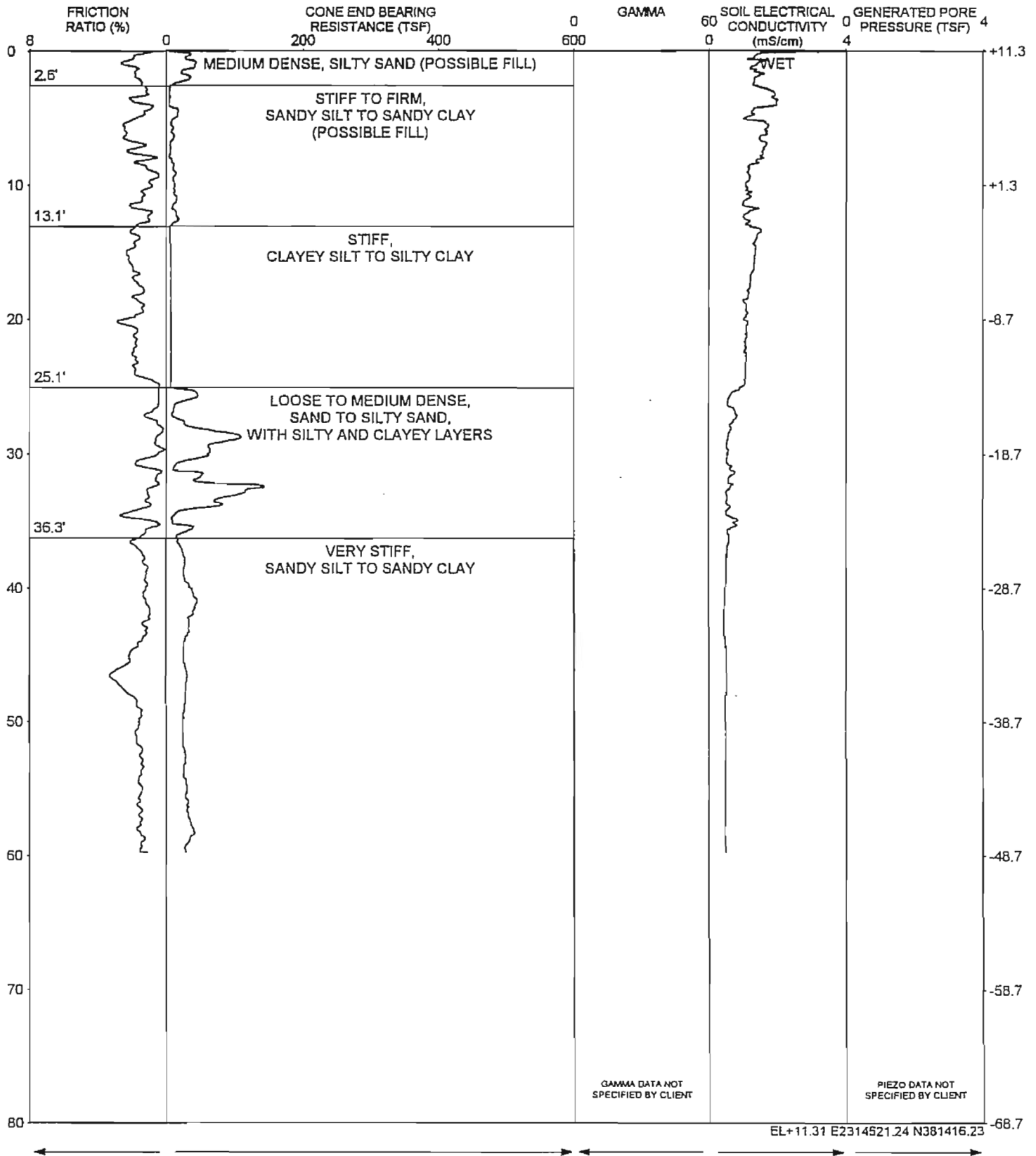


STRATIGRAPHICS

PROJECT NAME: Zone A Charleston Naval Base, S.C.
PROJECT NUMBER: 96-110-230

DATE: 09/26/96
SOUNDING NUMBER: CP031A

INTERPRETED CPT-EC LOG

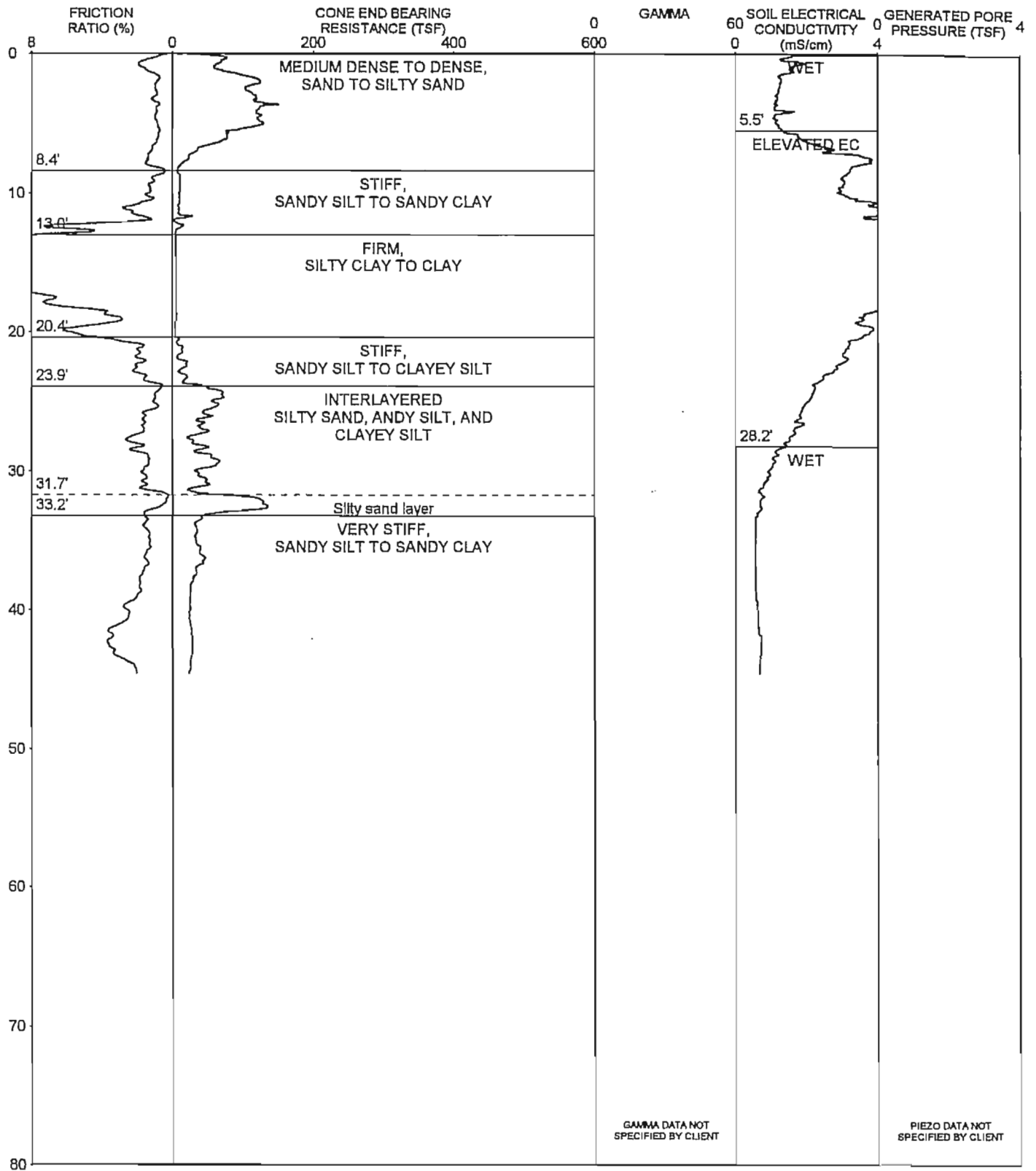


STRATIGRAPHICS

PROJECT NAME: Zone A Charleston Naval Base, S.C.
PROJECT NUMBER: 96-110-230

DATE: 09/26/96
SOUNDING NUMBER: CP031

INTERPRETED CPT-EC LOG

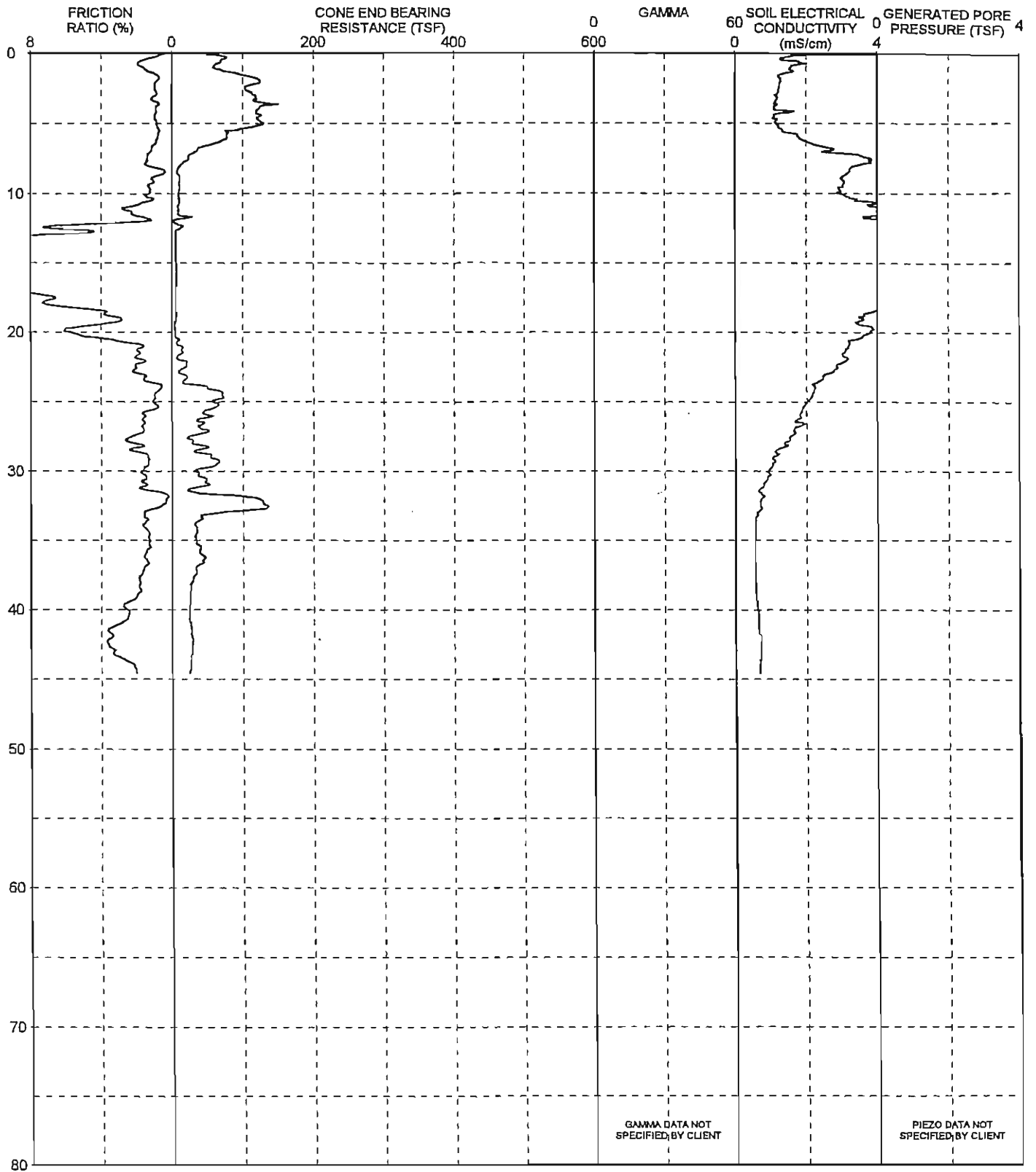


STRATIGRAPHICS

PROJECT NAME: Zone A Charleston Naval Base, S.C.
PROJECT NUMBER: 96-110-230

DATE: 09/26/97
SOUNDING NUMBER: CP033

CPT-EC LOG

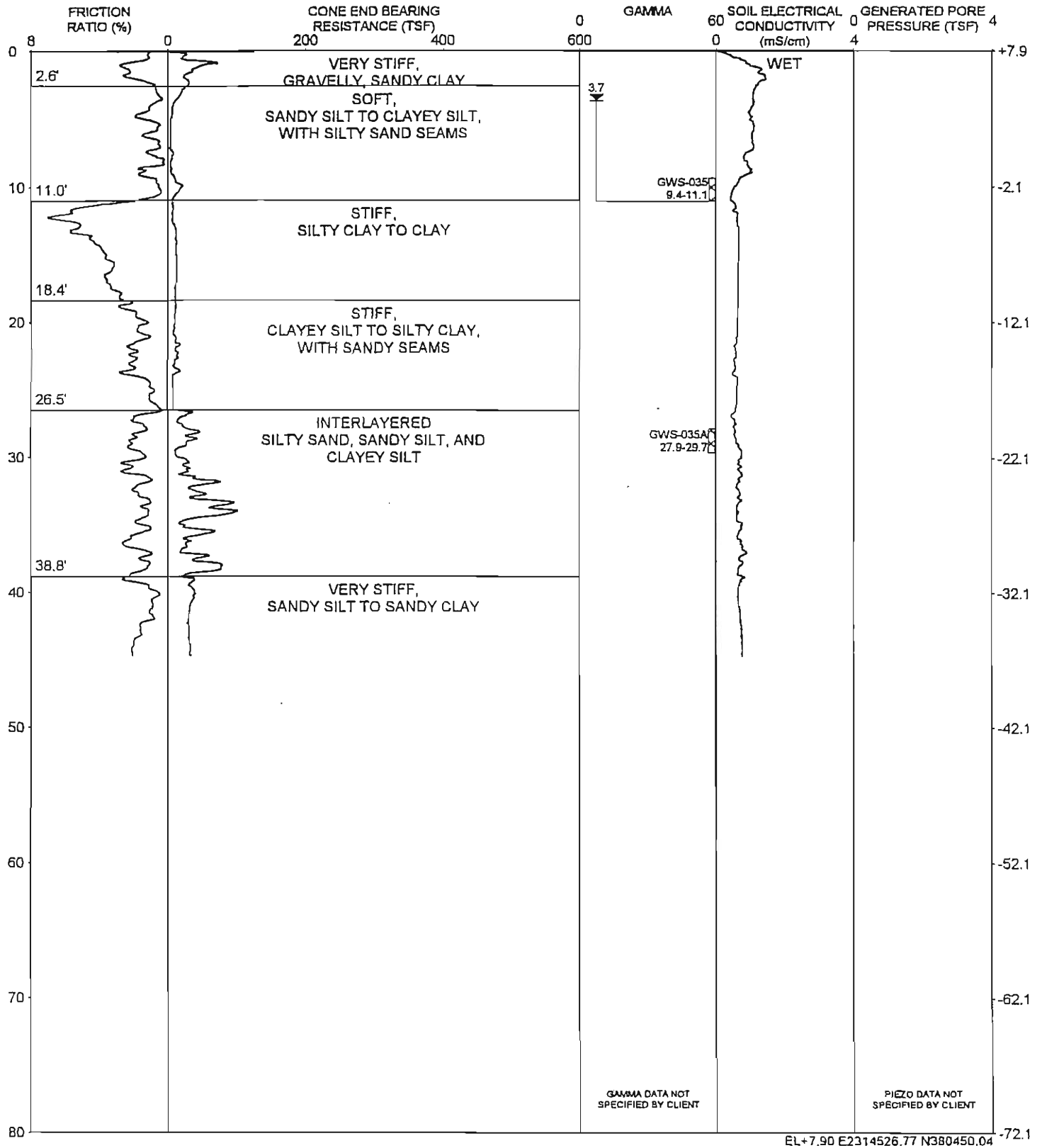


STRATIGRAPHICS

PROJECT NAME: Zone A Charleston Naval Base, S.C.
PROJECT NUMBER: 96-110-230

DATE: 09/26/97
SOUNDING NUMBER: CP033

INTERPRETED CPT-EC LOG

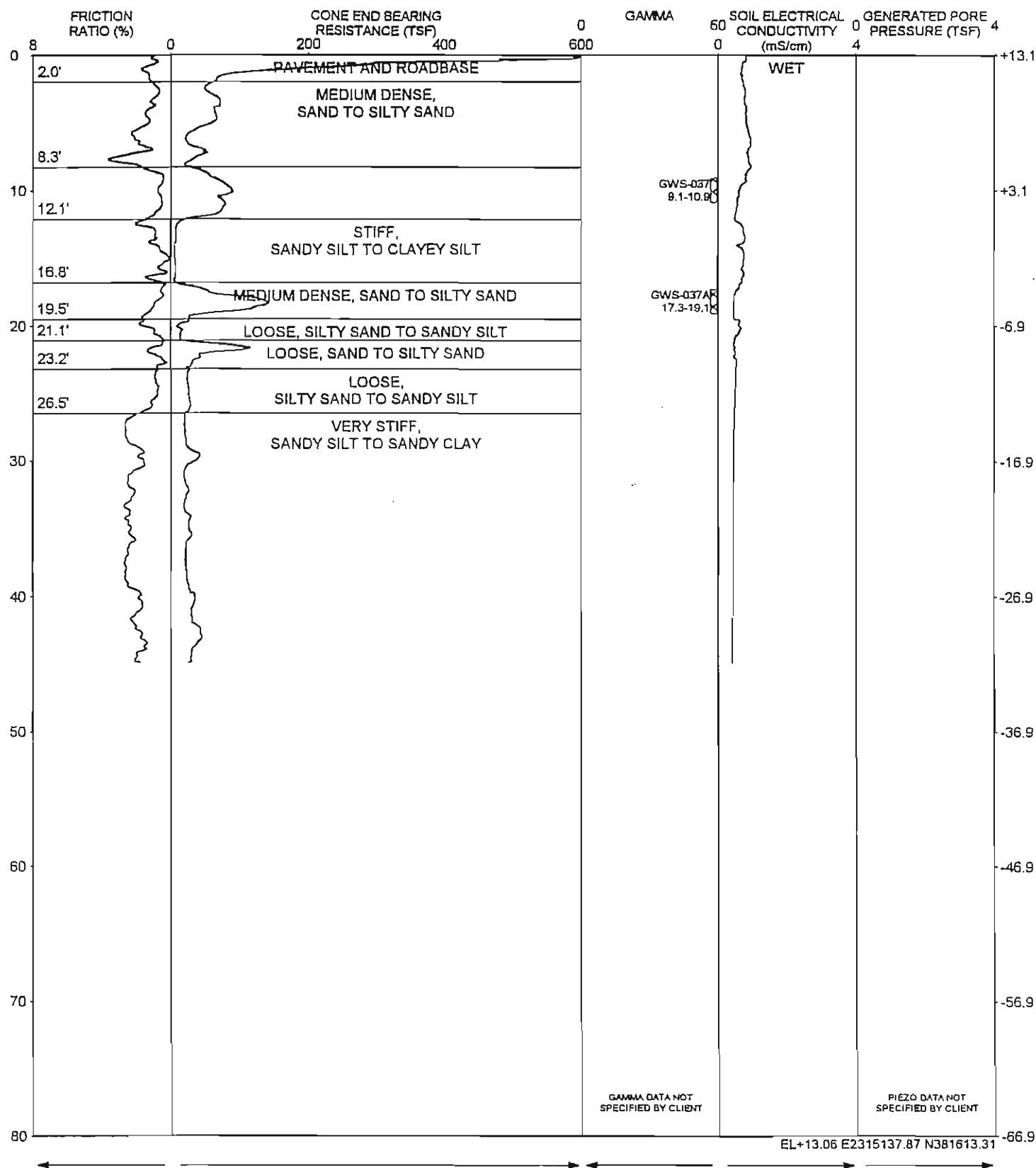


STRATIGRAPHICS

PROJECT NAME: Zone A Charleston Naval Base, S.C.
PROJECT NUMBER: 96-110-230

DATE: 09/27/96
SOUNDING NUMBER: CP035

INTERPRETED CPT-EC LOG



STRATIGRAPHICS

PROJECT NAME: Zone A Charleston Naval Base, S.C.
PROJECT NUMBER: 96-110-230

DATE: 09/30/96
SOUNDING NUMBER: CP037

STRATIGRAPHICS

PAGE 1

JOB NO: '96-110-220
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp001

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	FRICION (TSF)	RATIO (%)	GENERATED PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (Nf)
1.0	373.0	600.8	5.0	1.4		257	V dense, Sa gravel to si gr sand	42-46	+100				+ 62	+ 100
1.5	370.1	563.7	5.1	1.4		380	V dense, Sa gravel to si gr sand	42-46	+100				+ 66	+ 100
2.0	286.4	418.2	5.9	1.7		379	V dense, Sa gravel to si gr sand	42-46	+100				+ 68	+ 100
2.5	251.4	355.0	5.2	1.7		393	V dense, Sa gravel to si gr sand	42-46	80-100				+ 71	+ 100
3.0	370.1	507.9	7.1	2.1		342	V dense, Sa gravel to si gr sand	40-42	+100				+ 73	+ 100
3.5	282.2	377.8	3.5	1.1		236	V dense, Sand to silty sand	42-46	80-100				+ 75	+ 100
4.0	194.6	254.8	2.4	1.0		258	Dense, Sand to silty sand	42-46	60-80				55 - 76	72 - 99
4.5	109.7	140.9	1.6	1.1		358	Dense, Sand to silty sand	40-42	60-80				31 - 36	40 - 46
5.0	72.3	91.2	0.8	0.9		427	Med dense, Sand to silty sand	40-42	40-60				18 - 24	23 - 30
5.5	49.2	61.0	1.1	1.7		528	Med dense, Silty sand to sandy silt	36-37	40-60				16 - 19	20 - 23
6.0	37.7	46.1	1.4	3.0		543	V stiff, Sandy silt to sandy clay			25	2.99	2.88	16 - 19	20 - 23
6.5	52.1	62.7	0.8	1.6		462	Med dense, Silty sand to sandy silt	36-37	40-60				17 - 19	20 - 23
7.0	35.0	41.6	1.0	2.2		496	Med dense, Silty sand to sandy silt	27-31	40-60				13 - 14	15 - 17
7.5	46.8	54.9	1.1	2.5		547	Dense, Silty sand to sandy silt	27-31	60-80				20 - 26	23 - 30
8.0	44.8	51.9	0.4	0.9		503	Loose, Sand to silty sand	37-40	20-40				9 - 10	10 - 12
8.5	44.5	51.0	0.2	0.5		415	Loose, Sand to silty sand	37-40	20-40				6 - 9	7 - 10
9.0	45.7	51.9	0.3	0.6		346	Loose, Sand to silty sand	37-40	20-40				9 - 11	10 - 12
9.5	39.5	44.3	0.3	0.7		345	Loose, Sand to silty sand	37-40	20-40				6 - 9	7 - 10
10.0	34.7	38.5	0.2	0.7		314	Loose, Sand to silty sand	36-37	20-40				5 - 6	6 - 7
10.5	41.9	46.3	0.3	0.5		321	Loose, Sand to silty sand	37-40	20-40				6 - 9	7 - 10
11.0	69.8	76.8	0.3	0.3		285	Loose, Sand to silty sand	40-42	20-40				14 - 15	15 - 17
11.5	118.8	130.2	0.9	0.7		239	Med dense, Sand to silty sand	40-42	40-60				30 - 37	33 - 40
12.0	119.5	130.4	1.2	1.0		242	Med dense, Sand to silty sand	40-42	40-60				37 - 42	40 - 46
12.5	88.5	96.2	1.0	0.9		253	Med dense, Sand to silty sand	40-42	40-60				21 - 28	23 - 30
13.0	46.4	50.1	0.9	1.4		272	Med dense, Silty sand to sandy silt	36-37	40-60				11 - 14	12 - 15
13.5	84.3	90.7	0.5	0.5		384	Med dense, Sand to silty sand	40-42	40-60				19 - 21	20 - 23
14.0	165.6	177.6	1.2	0.8		338	Dense, Sand to silty sand	42-46	60-80				43 - 56	46 - 60
14.5	110.5	118.0	1.4	1.0		271	Med dense, Sand to silty sand	40-42	40-60				31 - 37	33 - 40
15.0	78.2	83.2	1.1	1.3		287	Med dense, Silty sand to sandy silt	37-40	40-60				22 - 28	23 - 30
15.5	20.6	21.8	1.1	2.6		317	Stiff, Sandy clay to silty clay *			20	1.97	2.29	7 - 9	7 - 10
16.0	5.7	6.0	0.3	2.5		554	Firm, Clayey silt to silty clay			10	0.94	0.57	1 - 3	1 - 3
16.5	4.9	5.2	0.1	2.2		676	Soft, Clayey silt to silty clay			18	0.43	0.24	1 - 3	1 - 3
17.0	4.3	4.5	0.1	3.1		719	Soft, Silty clay to clay			18	0.36	0.28	1 - 3	1 - 3
17.5	4.1	4.3	0.2	4.1		724	Soft, Clay			18	0.34	0.35	1 - 3	1 - 3
18.0	4.1	4.2	0.2	4.8		729	Soft, Clay			18	0.33	0.39	1 - 3	1 - 3
18.5	4.2	4.3	0.2	4.8		722	Soft, Clay			18	0.34	0.40	1 - 3	1 - 3
19.0	4.1	4.2	0.2	3.3		717	Soft, Silty clay to clay			18	0.32	0.31	1 - 3	1 - 3
19.5	8.0	8.2	0.2	1.8		653	Stiff, Clayey silt to silty clay			10	1.36	0.38	1 - 3	1 - 3
20.0	17.2	17.7	0.2	1.1		595	Loose, Silty sand to sandy silt	27-31	20-40				3 - 4	3 - 4
20.5	38.4	39.2	0.3	0.8		455	Loose, Silty sand to sandy silt	36-37	20-40				7 - 10	7 - 10

STRATIGRAPHICS

JOB NO: '96-110-220
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp001

PAGE 2

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED GENERATED			SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED		SPT (N)	NORM SPT (Nf)
			FRICTION (TSF)	RATIO (%)	PORE WATER PRESSURE (TSF)						SHEAR STRENGTH (KSF)	LARGE STRAIN SHEAR STRENGTH (KSF)		
21.0	34.9	35.6	0.5	1.4		351	Loose, Silty sand to sandy silt	36-37	20-40				7 - 10	7 - 10
21.5	41.7	42.3	0.4	1.0		482	Loose, Silty sand to sandy silt	36-37	20-40				7 - 10	7 - 10
22.0	47.0	47.5	0.5	1.1		320	Med dense, Silty sand to sandy silt	36-37	40-60				10 - 12	10 - 12
22.5	51.3	51.7	0.5	0.9		342	Loose, Sand to silty sand	37-40	20-40				10 - 12	10 - 12
23.0	69.2	69.5	0.6	0.7		313	Med dense, Sand to silty sand	37-40	40-60				15 - 17	15 - 17
23.5	94.1	94.3	0.7	0.7		275	Med dense, Sand to silty sand	40-42	40-60				23 - 30	23 - 30
24.0	100.9	100.7	0.8	0.8		245	Med dense, Sand to silty sand	40-42	40-60				23 - 30	23 - 30
24.5	81.8	81.4	0.9	0.9		253	Med dense, Sand to silty sand	40-42	40-60				20 - 23	20 - 23
25.0	75.9	75.3	0.8	0.9		273	Med dense, Sand to silty sand	37-40	40-60				17 - 20	17 - 20
25.5	96.3	95.3	0.7	0.7		273	Med dense, Sand to silty sand	40-42	40-60				23 - 30	23 - 30
26.0	93.1	91.9	1.0	1.0		255	Med dense, Sand to silty sand	40-42	40-60				23 - 30	23 - 30
26.5	109.8	108.0	0.8	0.7		260	Med dense, Sand to silty sand	40-42	40-60				23 - 31	23 - 30
27.0	106.0	103.9	1.0	1.0		254	Med dense, Sand to silty sand	40-42	40-60				31 - 34	30 - 33
27.5	104.0	101.7	1.0	0.9		248	Med dense, Sand to silty sand	40-42	40-60				31 - 34	30 - 33
28.0	103.2	100.6	1.0	0.9		250	Med dense, Sand to silty sand	40-42	40-60				24 - 31	23 - 30
28.5	112.7	109.6	0.9	0.8		255	Med dense, Sand to silty sand	40-42	40-60				31 - 34	30 - 33
29.0	120.0	116.3	1.1	0.9		266	Med dense, Sand to silty sand	40-42	40-60				34 - 41	33 - 40
29.5	115.8	112.0	1.1	1.0		266	Med dense, Sand to silty sand	40-42	40-60				31 - 34	30 - 33
30.0	102.4	98.7	0.9	0.8		268	Med dense, Sand to silty sand	40-42	40-60				24 - 31	23 - 30
30.5	103.7	99.7	1.1	1.0		288	Med dense, Sand to silty sand	40-42	40-60				31 - 34	30 - 33
31.0	51.4	49.3	1.0	1.3		294	Med dense, Silty sand to sandy silt	36-37	40-60				13 - 16	12 - 15
31.5	17.1	16.3	0.7	2.2		492	V stiff, Sandy silt to clayey silt			15	2.02	1.45	4 - 6	4 - 6
32.0	9.9	9.4	0.2	1.7		694	Stiff, Sandy silt to clayey silt			10	1.59	0.39	1 - 3	1 - 3
32.5	9.7	9.2	0.2	2.2		790	Stiff, Clayey silt to silty clay			10	1.54	0.45	1 - 3	1 - 3
33.0	8.8	8.4	0.2	2.7		780	Stiff, Clayey silt to silty clay			10	1.37	0.45	1 - 3	1 - 3

NOTES: * Indicates lightly overconsolidated soil
 ** Indicates heavily overconsolidated or cemented soil

Mixed soils containing both granular and fine grained particles (e.g. clayey sands) may undergo partial drained failure during CPT. Both undrained and drained parameters can be estimated for these soils.

Structure rate of loading should be considered in choosing which strength parameters to use for design. Drained and undrained parameters must not be combined as such combination will result in significant overprediction of in situ shear strength.

STRATIGRAPHICS

JOB NO: '96-110-220
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp002

PAGE 1

DEPTH (F1)	CONE (TSF)	NORM CONE (TSF)	AVERAGED		GENERATED PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED LARGE SHEAR STRENGTH (KSF)		SPT (N)	NORM SPT (Nf)
			FRICTION (TSF)	RATIO (%)							UNDRAINED SHEAR STRENGTH (KSF)	STRAIN SHEAR STRENGTH (KSF)		
1.0	128.2	206.5	1.5	1.0		642	Dense, Sand to silty sand	42-46	60-80				37 - 45	60 - 72
1.5	171.4	261.1	1.8	1.1		216	Dense, Sand to silty sand	42-46	60-80				47 - 65	72 - 99
2.0	113.8	166.1	1.5	1.1		156	Dense, Sand to silty sand	42-46	60-80				31 - 41	46 - 60
2.5	61.9	87.4	1.1	1.3		142	Med dense, Silty sand to sandy silt	37-40	40-60				16 - 21	23 - 30
3.0	21.0	28.8	0.8	2.0		293	V stiff, Sandy silt to sandy clay			20	2.08	1.59	5 - 7	7 - 10
3.5	16.2	21.7	0.2	1.2		554	Loose, Silty sand to sandy silt	27-31	20-40				3 - 4	4 - 6
4.0	9.1	11.9	0.2	1.9		1101	Stiff, Sandy silt to clayey silt			15	1.17	0.41	1 - 2	1 - 3
4.5	8.2	10.6	0.3	4.0		1294	Stiff, Silty clay to clay *			15	1.06	0.70	3 - 5	4 - 6
5.0	9.0	11.3	0.4	3.9		1336	Stiff, Silty clay to clay *			15	1.16	0.71	3 - 5	4 - 6
5.5	9.3	11.6	0.5	4.7		1390	Stiff, Silty clay to clay *			15	1.20	0.91	5 - 6	6 - 7
6.0	10.1	12.3	0.5	4.3		1384	Stiff, Silty clay to clay *			15	1.30	0.96	5 - 6	6 - 7
6.5	12.3	14.8	0.4	2.4		1256	Stiff, Clayey silt to silty clay			15	1.59	0.80	3 - 5	4 - 6
7.0	22.7	27.0	0.5	2.6		917	V stiff, Sandy silt to sandy clay			20	2.23	1.08	8 - 10	10 - 12
7.5	15.1	17.7	0.5	2.6		1047	Stiff, Sandy clay to silty clay *			15	1.95	1.05	5 - 6	6 - 7
8.0	19.4	22.5	0.5	1.4		898	Loose, Silty sand to sandy silt	27-31	20-40				3 - 5	4 - 6
8.5	47.8	54.8	0.2	0.4		468	Loose, Sand to silty sand	37-40	20-40				6 - 9	7 - 10
9.0	44.4	50.4	0.2	0.3		384	Loose, Sand to silty sand	37-40	20-40				6 - 9	7 - 10
9.5	43.0	48.3	0.2	0.3		396	Loose, Sand to silty sand	37-40	20-40				6 - 9	7 - 10
10.0	39.9	44.3	0.2	0.5		415	Loose, Sand to silty sand	37-40	20-40				6 - 9	7 - 10
10.5	47.8	52.9	0.2	0.4		454	Loose, Sand to silty sand	37-40	20-40				6 - 9	7 - 10
11.0	51.7	56.9	0.3	0.5		429	Loose, Sand to silty sand	37-40	20-40				9 - 11	10 - 12
11.5	53.5	58.7	0.3	0.5		424	Loose, Sand to silty sand	37-40	20-40				9 - 11	10 - 12
12.0	48.4	52.8	0.2	0.3		433	Loose, Sand to silty sand	37-40	20-40				6 - 9	7 - 10
12.5	67.7	73.6	0.1	0.2		438	Loose, Sand to silty sand	40-42	20-40				11 - 14	12 - 15
13.0	59.4	64.2	0.7	1.1		372	Med dense, Silty sand to sandy silt	37-40	40-60				16 - 18	17 - 20
13.5	18.7	20.2	0.9	2.6		468	V stiff, Sandy clay to silty clay *			15	2.39	1.71	6 - 6	6 - 7
14.0	12.8	13.8	0.5	3.1		998	Stiff, Sandy clay to silty clay *			15	1.60	1.01	4 - 6	4 - 6
14.5	27.2	29.0	0.4	1.7		1056	Loose, Silty sand to sandy silt	27-31	20-40				7 - 9	7 - 10
15.0	13.8	14.7	0.5	1.0		530	Loose, Silty sand to sandy silt	27-31	20-40				1 - 3	1 - 3
15.5	76.5	81.0	0.5	0.6		605	Med dense, Sand to silty sand	40-42	40-60				16 - 19	17 - 20
16.0	91.7	96.8	0.6	0.6		563	Med dense, Sand to silty sand	40-42	40-60				22 - 28	23 - 30
16.5	120.7	126.9	1.0	0.9		624	Med dense, Sand to silty sand	40-42	40-60				31 - 38	33 - 40
17.0	96.7	101.3	0.9	0.9		653	Med dense, Sand to silty sand	40-42	40-60				22 - 29	23 - 30
17.5	52.9	55.3	1.4	1.7		711	Med dense, Silty sand to sandy silt	36-37	40-60				16 - 19	17 - 20
18.0	81.5	84.8	0.6	0.7		981	Med dense, Sand to silty sand	40-42	40-60				19 - 22	20 - 23
18.5	98.5	102.1	0.8	0.8		784	Med dense, Sand to silty sand	40-42	40-60				22 - 29	23 - 30
19.0	96.0	99.1	1.0	1.0		707	Med dense, Sand to silty sand	40-42	40-60				29 - 32	30 - 33
19.5	83.4	85.8	0.9	1.1		739	Med dense, Sand to silty sand	37-40	40-60				22 - 29	23 - 30
20.0	59.9	61.4	1.0	1.4		775	Med dense, Silty sand to sandy silt	37-40	40-60				17 - 20	17 - 20
20.5	27.8	28.4	1.2	2.9		1343	V stiff, Sandy clay to silty clay *			20	2.65	2.49	12 - 15	12 - 15

STRATIGRAPHICS

JOB NO: '96-110-220
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp002

PAGE 2

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED		GENERATED PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)		SPT (N)	NORM SPT (Wf)
			FRICTION (TSF)	RATIO (%)							UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)		
21.0	52.2	53.2	0.9	2.4		1769	Hard, Sandy silt to sandy clay			25	4.08	1.71	20 - 23	20 - 23
21.5	17.0	17.2	1.0	3.1		1861	V stiff, Sandy clay to silty clay *			15	2.09	1.92	6 - 7	6 - 7
22.0	25.8	26.1	0.4	1.1		2201	Loose, Silty sand to sandy silt	31-36	20-40				4 - 6	4 - 6
22.5	34.9	35.2	0.7	1.7		1718	Med dense, Silty sand to sandy silt	27-31	40-60				10 - 12	10 - 12
23.0	33.2	33.4	0.4	0.6		1918	Loose, Silty sand to sandy silt	36-37	20-40				6 - 7	6 - 7
23.5	85.2	85.4	0.6	0.8		1967	Med dense, Sand to silty sand	40-42	40-60				20 - 23	20 - 23
24.0	75.6	75.5	1.1	1.3		2392	Med dense, Silty sand to sandy silt	37-40	40-60				20 - 23	20 - 23
24.5	20.2	20.1	1.1	2.6		2737	V stiff, Sandy clay to silty clay *			15	2.50	2.19	6 - 7	6 - 7
25.0	21.7	21.5	0.3	0.6		2557	Loose, Silty sand to sandy silt	31-36	20-40				3 - 4	3 - 4
25.5	105.3	104.2	0.7	0.5		1675	Med dense, Sand to silty sand	40-42	40-60				23 - 30	23 - 30
26.0	141.9	140.0	1.4	0.9		1049	Med dense, Sand to silty sand	40-42	40-60				41 - 47	40 - 46
26.5	160.2	157.6	1.3	1.0		878	Dense, Sand to silty sand	40-42	60-80				47 - 61	46 - 60
27.0	145.3	142.5	1.7	1.1		714	Dense, Sand to silty sand	40-42	60-80				41 - 47	40 - 46
27.5	147.5	144.2	1.7	1.1		648	Dense, Sand to silty sand	40-42	60-80				47 - 61	46 - 60
28.0	129.3	126.0	1.6	1.1		769	Med dense, Sand to silty sand	40-42	40-60				41 - 47	40 - 46
28.5	129.6	126.0	1.4	1.1		966	Med dense, Sand to silty sand	40-42	40-60				34 - 41	33 - 40
29.0	131.1	127.1	1.5	1.1		542	Med dense, Sand to silty sand	40-42	40-60				41 - 47	40 - 46
29.5	108.2	104.6	1.5	1.2		376	Med dense, Sand to silty sand	40-42	40-60				34 - 41	33 - 40
30.0	107.3	103.4	1.1	1.1		429	Med dense, Sand to silty sand	40-42	40-60				31 - 34	30 - 33
30.5	95.7	92.0	1.1	1.1		365	Med dense, Sand to silty sand	40-42	40-60				24 - 31	23 - 30
31.0	97.7	93.6	1.1	1.0		374	Med dense, Sand to silty sand	40-42	40-60				24 - 31	23 - 30
31.5	108.5	103.8	1.1	1.1		351	Med dense, Sand to silty sand	40-42	40-60				31 - 35	30 - 33
32.0	94.2	89.9	1.2	1.2		341	Med dense, Sand to silty sand	37-40	40-60				24 - 31	23 - 30
32.5	98.1	93.3	1.0	0.9		367	Med dense, Sand to silty sand	40-42	40-60				24 - 32	23 - 30
33.0	126.3	119.8	1.2	0.9		343	Med dense, Sand to silty sand	40-42	40-60				35 - 42	33 - 40
33.5	134.4	127.2	1.4	1.0		328	Med dense, Sand to silty sand	40-42	40-60				35 - 42	33 - 40
34.0	96.0	90.6	1.4	1.2		330	Med dense, Sand to silty sand	37-40	40-60				24 - 32	23 - 30
34.5	65.1	61.3	1.6	1.7		386	Med dense, Silty sand to sandy silt	36-37	40-60				21 - 24	20 - 23
35.0	119.9	112.5	1.0	0.8		478	Med dense, Sand to silty sand	40-42	40-60				32 - 35	30 - 33
35.5	130.0	121.7	1.4	1.0		372	Med dense, Sand to silty sand	40-42	40-60				35 - 43	33 - 40
36.0	146.9	137.3	1.6	0.9		350	Med dense, Sand to silty sand	40-42	40-60				43 - 49	40 - 46
36.5	183.4	170.9	1.9	0.9		341	Dense, Sand to silty sand	42-46	60-80				49 - 64	46 - 60
37.0	206.9	192.4	2.5	1.2		327	Dense, Sand to silty sand	42-46	60-80				65 - 77	60 - 72
37.5	186.2	172.7	2.3	1.2		327	Dense, Sand to silty sand	40-42	60-80				65 - 78	60 - 72
38.0	195.0	180.4	2.2	1.1		332	Dense, Sand to silty sand	42-46	60-80				65 - 78	60 - 72
38.5	186.2	171.8	2.3	1.2		333	Dense, Sand to silty sand	40-42	60-80				65 - 78	60 - 72
39.0	168.6	155.3	2.1	1.2		338	Dense, Sand to silty sand	40-42	60-80				50 - 65	46 - 60
39.5	141.6	130.1	1.7	1.1		348	Med dense, Sand to silty sand	40-42	40-60				44 - 50	40 - 46
40.0	122.0	111.8	1.8	1.3		401	Med dense, Sand to silty sand	40-42	40-60				36 - 44	33 - 40
40.5	83.1	76.0	1.8	1.6		776	Med dense, Silty sand to sandy silt	37-40	40-60				25 - 33	23 - 30

STRATIGRAPHICS

PAGE 3

JOB NO: '96-110-220
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp002

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	FRICION (TSF)	GENERATED RATIO (%)	PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (Nf)
41.0	128.0	116.7	1.4	1.1		1031	Med dense, Sand to silty sand	40-42	40-60				36 - 44	33 - 40
41.5	136.8	124.5	1.6	1.1		467	Med dense, Sand to silty sand	40-42	40-60				36 - 44	33 - 40
42.0	156.5	142.1	1.9	1.2		439	Dense, Sand to silty sand	40-42	60-80				51 - 66	46 - 60
42.5	152.4	138.1	1.8	1.2		375	Dense, Sand to silty sand	40-42	60-80				44 - 51	40 - 46
43.0	142.2	128.5	1.6	1.1		370	Med dense, Sand to silty sand	40-42	40-60				44 - 51	40 - 46
43.5	106.9	96.4	1.9	1.4		371	Med dense, Silty sand to sandy silt	37-40	40-60				33 - 37	30 - 33
44.0	139.6	125.6	2.0	1.4		394	Dense, Sand to silty sand	40-42	60-80				44 - 51	40 - 46
44.5	84.9	76.3	1.5	1.3		395	Med dense, Silty sand to sandy silt	37-40	40-60				26 - 33	23 - 30
45.0	89.1	79.8	1.1	1.1		465	Med dense, Sand to silty sand	37-40	40-60				22 - 26	20 - 23
45.5	115.3	103.1	1.2	1.0		427	Med dense, Sand to silty sand	40-42	40-60				34 - 37	30 - 33
46.0	127.5	113.7	1.3	0.9		391	Med dense, Sand to silty sand	40-42	40-60				34 - 37	30 - 33
46.5	149.4	133.0	1.3	0.8		378	Med dense, Sand to silty sand	40-42	40-60				37 - 45	33 - 40
47.0	180.2	160.1	1.8	1.0		365	Dense, Sand to silty sand	40-42	60-80				52 - 68	46 - 60
47.5	166.0	147.1	1.9	1.1		376	Dense, Sand to silty sand	40-42	60-80				52 - 68	46 - 60
48.0	156.8	138.7	1.8	1.1		392	Dense, Sand to silty sand	40-42	60-80				45 - 52	40 - 46
48.5	131.5	116.1	1.6	1.1		403	Med dense, Sand to silty sand	40-42	40-60				37 - 45	33 - 40
49.0	114.9	101.2	1.3	1.1		453	Med dense, Sand to silty sand	40-42	40-60				34 - 37	30 - 33
49.5	124.1	109.0	0.9	0.8		456	Med dense, Sand to silty sand	40-42	40-60				34 - 38	30 - 33
50.0	132.8	116.5	1.5	1.1		456	Med dense, Sand to silty sand	40-42	40-60				38 - 46	33 - 40
50.5	124.5	109.0	1.7	1.2		481	Med dense, Sand to silty sand	40-42	40-60				38 - 46	33 - 40
51.0	72.0	62.9	1.2	1.2		831	Med dense, Silty sand to sandy silt	37-40	40-60				19 - 23	17 - 20
51.5	152.6	133.0	1.3	0.6		586	Med dense, Sand to silty sand	40-42	40-60				38 - 46	33 - 40
52.0	214.8	186.9	2.0	0.9		581	Dense, Sand to silty sand	42-46	60-80				53 - 69	46 - 60
52.5	176.6	153.4	1.4	0.5		584	Med dense, Sand to silty sand	42-46	40-60				38 - 46	33 - 40
53.0	299.6	259.7	0.6	0.2		638	Dense, Sa gravel to gr sand	+46	60-80				53 - 69	46 - 60
53.5	189.6	164.0	0.2	0.1		685	Med dense, Sa gravel to gr sand	42-46	40-60				38 - 46	33 - 40
54.0	202.6	175.0	0.2	0.1		882	Med dense, Sa gravel to gr sand	42-46	40-60				38 - 46	33 - 40
54.5	125.8	108.4	0.6	0.4		1051	Med dense, Sand to silty sand	40-42	40-60				27 - 35	23 - 30
55.0	68.1	58.6	1.0	1.0		1546	Med dense, Sand to silty sand	37-40	40-60				14 - 17	12 - 15
55.5	52.8	45.3	0.3	0.6		2156	Loose, Sand to silty sand	37-40	20-40				8 - 12	7 - 10
56.0	48.8	41.8	0.7	1.4		2647	Med dense, Silty sand to sandy silt	36-37	40-60				12 - 14	10 - 12
56.5	47.0	40.2	0.6	1.3		2996	Med dense, Silty sand to sandy silt	36-37	40-60				12 - 14	10 - 12
57.0	46.0	39.2	0.6	1.2		3439	Loose, Silty sand to sandy silt	36-37	20-40				8 - 12	7 - 10
57.5	38.1	32.4	0.5	1.3		3843	Loose, Silty sand to sandy silt	27-31	20-40				8 - 12	7 - 10
58.0	32.9	28.0	0.4	1.2		4438	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
58.5	31.0	26.3	0.4	1.2		4913	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
59.0	31.2	26.4	0.5	1.5		4899	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
59.5	30.9	26.1	0.5	1.6		5226	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
60.0	29.3	24.7	0.4	1.5		5450	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7

NOTES: * Indicates lightly overconsolidated soil
 ** Indicates heavily overconsolidated or cemented soil

Mixed soils containing both granular and fine grained particles (e.g. clayey sands) may undergo partial drained failure during CPT. Both undrained and drained parameters can be estimated for these soils.

Structure rate of loading should be considered in choosing which strength parameters to use for design. Drained and undrained parameters must not be combined as such combination will result in significant overprediction of in situ shear strength.

STRATIGRAPHICS

PAGE 1

JOB NO: '96-110-220
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp003

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED		GENERATED PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)		SPT (N)	NORM SPT (Nf)
			FRICTION (TSF)	RATIO (%)							UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED SHEAR STRENGTH (KSF)		
1.0	311.6	501.9	3.7	1.3		834	V dense, Sa gravel to si gr sand	42-46	80-100				+ 62	+ 100
1.5	166.0	252.8	3.3	1.4		1010	Dense, Sand to silty sand	42-46	60-80				47 - 65	72 - 99
2.0	154.4	225.4	2.1	1.3		810	Dense, Sand to silty sand	42-46	60-80				49 - 68	72 - 99
2.5	111.4	157.3	1.0	0.8		498	Med dense, Sand to silty sand	42-46	40-60				28 - 33	40 - 46
3.0	93.7	128.5	0.7	0.7		463	Med dense, Sand to silty sand	40-42	40-60				24 - 29	33 - 40
3.5	79.6	106.6	0.5	0.6		406	Med dense, Sand to silty sand	40-42	40-60				17 - 22	23 - 30
4.0	67.3	88.1	0.3	0.4		376	Med dense, Sand to silty sand	40-42	40-60				13 - 15	17 - 20
4.5	64.3	82.6	0.1	0.2		380	Loose, Sand to silty sand	40-42	20-40				12 - 13	15 - 17
5.0	65.5	82.6	0.0	0.1		425	Loose, Sand to silty sand	40-42	20-40				10 - 12	12 - 15
5.5	60.4	75.0	0.1	0.1		382	Loose, Sand to silty sand	40-42	20-40				10 - 12	12 - 15
6.0	61.6	75.2	0.1	0.1		416	Loose, Sand to silty sand	40-42	20-40				10 - 12	12 - 15
6.5	52.8	63.6	0.0	0.1		431	Loose, Sand to silty sand	40-42	20-40				6 - 8	7 - 10
7.0	28.2	33.5	0.3	0.8		341	Loose, Silty sand to sandy silt	36-37	20-40				5 - 6	6 - 7
7.5	25.8	30.3	0.0	0.1		421	V loose, Sand to silty sand	36-37	0-20				3 - 3	3 - 4
8.0	33.7	39.1	0.1	0.2		351	Loose, Sand to silty sand	37-40	20-40				5 - 6	6 - 7
8.5	56.8	65.1	0.0	0.0		418	Loose, Sand to silty sand	40-42	20-40				6 - 9	7 - 10
9.0	53.1	60.2	0.1	0.2		313	Loose, Sand to silty sand	40-42	20-40				6 - 9	7 - 10
9.5	51.3	57.6	0.1	0.3		290	Loose, Sand to silty sand	40-42	20-40				6 - 9	7 - 10
10.0	54.4	60.4	0.2	0.3		299	Loose, Sand to silty sand	40-42	20-40				9 - 11	10 - 12
10.5	71.7	79.3	0.4	0.5		293	Med dense, Sand to silty sand	40-42	40-60				15 - 18	17 - 20
11.0	77.8	85.6	0.5	0.6		300	Med dense, Sand to silty sand	40-42	40-60				15 - 18	17 - 20
11.5	28.8	31.5	0.6	1.0		315	Loose, Silty sand to sandy silt	36-37	20-40				5 - 6	6 - 7
12.0	7.0	7.6	0.4	2.9		847	Stiff, Silty clay to clay			10	1.25	0.85	1 - 3	1 - 3
12.5	5.1	5.6	0.1	1.3		1021	Soft, Clayey silt to silty clay			18	0.49	0.14	1 - 3	1 - 3
13.0	6.0	6.5	0.1	1.2		1032	Stiff, Sandy silt to clayey silt			10	1.05	0.16	1 - 3	1 - 3
13.5	6.0	6.4	0.1	1.5		1076	Stiff, Clayey silt to silty clay			10	1.03	0.18	1 - 3	1 - 3
14.0	5.7	6.1	0.1	1.8		1076	Firm, Clayey silt to silty clay			10	0.97	0.21	1 - 3	1 - 3
14.5	5.9	6.3	0.1	2.0		1053	Stiff, Clayey silt to silty clay			10	1.01	0.24	1 - 3	1 - 3
15.0	6.6	7.0	0.1	1.7		987	Stiff, Clayey silt to silty clay			10	1.13	0.24	1 - 3	1 - 3
15.5	7.4	7.9	0.1	1.8		1033	Stiff, Clayey silt to silty clay			10	1.30	0.28	1 - 3	1 - 3
16.0	8.1	8.5	0.1	1.8		948	Stiff, Clayey silt to silty clay			10	1.42	0.29	1 - 3	1 - 3
16.5	7.5	7.9	0.1	1.7		993	Stiff, Clayey silt to silty clay			10	1.30	0.27	1 - 3	1 - 3
17.0	7.6	8.0	0.1	1.8		950	Stiff, Clayey silt to silty clay			10	1.32	0.28	1 - 3	1 - 3
17.5	8.0	8.3	0.2	1.9		947	Stiff, Clayey silt to silty clay			10	1.39	0.30	1 - 3	1 - 3
18.0	8.3	8.6	0.2	1.9		996	Stiff, Clayey silt to silty clay			10	1.44	0.32	1 - 3	1 - 3
18.5	8.8	9.2	0.2	1.7		892	Stiff, Clayey silt to silty clay			10	1.55	0.31	1 - 3	1 - 3
19.0	9.0	9.3	0.2	1.8		1013	Stiff, Clayey silt to silty clay			10	1.57	0.34	1 - 3	1 - 3
19.5	8.4	8.6	0.1	1.1		783	Stiff, Sandy silt to clayey silt			10	1.44	0.20	1 - 3	1 - 3
20.0	9.7	10.0	0.2	1.5		1005	Stiff, Sandy silt to clayey silt			10	1.71	0.31	1 - 3	1 - 3
20.5	9.9	10.1	0.2	1.9		1093	Stiff, Clayey silt to silty clay			15	1.15	0.38	1 - 3	1 - 3

STRATIGRAPHICS

PAGE 2

JOB NO: '96-110-220
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp003

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED GENERATED			SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED LARGE SHEAR STRENGTH		SPT (N)	NORM SPT (Nf)
			FRICTION (TSF)	RATIO (%)	PORE WATER PRESSURE (TSF)						UNDRAINED SHEAR STRENGTH (KSF)	STRAIN SHEAR STRENGTH (KSF)		
21.0	10.2	10.4	0.1	1.4		713	Stiff, Sandy silt to clayey silt			15	1.20	0.29	1 - 3	1 - 3
21.5	9.9	10.0	0.1	1.4		812	Stiff, Sandy silt to clayey silt			10	1.71	0.29	1 - 3	1 - 3
22.0	10.5	10.6	0.2	1.9		1081	Stiff, Clayey silt to silty clay			15	1.22	0.40	1 - 3	1 - 3
22.5	10.9	11.0	0.2	1.5		851	Stiff, Sandy silt to clayey silt			15	1.28	0.33	1 - 3	1 - 3
23.0	10.9	11.0	0.2	1.9		1184	Stiff, Clayey silt to silty clay			15	1.27	0.42	1 - 3	1 - 3
23.5	11.3	11.3	0.3	2.3		1226	Stiff, Clayey silt to silty clay			15	1.32	0.51	1 - 3	1 - 3
24.0	10.9	10.9	0.3	2.3		1234	Stiff, Clayey silt to silty clay			15	1.27	0.51	1 - 3	1 - 3
24.5	10.5	10.4	0.2	2.3		1195	Stiff, Clayey silt to silty clay			15	1.20	0.49	1 - 3	1 - 3
25.0	10.5	10.5	0.2	2.2		1207	Stiff, Clayey silt to silty clay			15	1.21	0.49	1 - 3	1 - 3
25.5	11.3	11.2	0.2	2.0		1185	Stiff, Clayey silt to silty clay			15	1.30	0.46	1 - 3	1 - 3
26.0	11.6	11.5	0.2	1.8		1165	Stiff, Sandy silt to clayey silt			15	1.34	0.43	1 - 3	1 - 3
26.5	12.5	12.3	0.2	1.9		1164	Stiff, Sandy silt to clayey silt			15	1.45	0.46	1 - 3	1 - 3
27.0	12.2	11.9	0.3	2.0		1155	Stiff, Clayey silt to silty clay			15	1.40	0.51	1 - 3	1 - 3
27.5	13.1	12.8	0.2	1.8		1170	Stiff, Sandy silt to clayey silt			15	1.53	0.47	1 - 3	1 - 3
28.0	13.4	13.0	0.3	2.0		1108	Stiff, Sandy silt to clayey silt			15	1.56	0.55	3 - 4	3 - 4
28.5	13.4	13.0	0.3	2.2		1075	Stiff, Clayey silt to silty clay			15	1.56	0.60	3 - 4	3 - 4
29.0	13.3	12.9	0.3	1.9		1196	Stiff, Sandy silt to clayey silt			15	1.54	0.50	1 - 3	1 - 3
29.5	13.1	12.7	0.3	1.9		1164	Stiff, Sandy silt to clayey silt			15	1.52	0.51	1 - 3	1 - 3
30.0	13.5	13.0	0.3	2.5		1217	Stiff, Clayey silt to silty clay			15	1.56	0.66	3 - 4	3 - 4
30.5	13.8	13.3	0.3	2.3		1217	Stiff, Clayey silt to silty clay			15	1.60	0.63	3 - 4	3 - 4
31.0	13.8	13.2	0.3	2.2		1200	Stiff, Clayey silt to silty clay			15	1.59	0.60	3 - 4	3 - 4
31.5	13.1	12.6	0.3	2.3		1176	Stiff, Clayey silt to silty clay			15	1.50	0.63	3 - 4	3 - 4
32.0	13.9	13.2	0.3	2.6		1130	Stiff, Clayey silt to silty clay			15	1.59	0.69	3 - 4	3 - 4
32.5	12.7	12.1	0.3	2.6		1129	Stiff, Clayey silt to silty clay			15	1.44	0.69	3 - 4	3 - 4
33.0	12.3	11.7	0.3	2.6		1128	Stiff, Clayey silt to silty clay			15	1.38	0.64	3 - 4	3 - 4

NOTES: * Indicates lightly overconsolidated soil
 ** Indicates heavily overconsolidated or cemented soil

Mixed soils containing both granular and fine grained particles (e.g. clayey sands) may undergo partial drained failure during CPT. Both undrained and drained parameters can be estimated for these soils.

Structure rate of loading should be considered in choosing which strength parameters to use for design. Drained and undrained parameters must not be combined as such combination will result in significant overprediction of in situ shear strength.

STRATIGRAPHICS

PAGE 1

JOB NO: '96-110-220
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp004

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED		GENERATED PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)		SPT (N)	NORM SPT (Nf)
			FRICTION (TSF)	RATIO (%)							UNDRAINED SHEAR STRENGTH (KSF)	LARGE STRAIN SHEAR STRENGTH (KSF)		
1.0	60.9	98.1	1.2	0.9		161	Med dense, Sand to silty sand	40-42	40-60				14 - 19	23 - 30
1.5	149.2	227.3	2.0	1.5		196	Dense, Sand to silty sand	42-46	60-80				47 - 65	72 - 99
2.0	109.6	160.0	1.6	1.4		276	Dense, Sand to silty sand	40-42	60-80				41 - 49	60 - 72
2.5	89.3	126.1	1.2	1.2		299	Med dense, Sand to silty sand	40-42	40-60				28 - 33	40 - 46
3.0	47.2	64.7	1.1	1.7		323	Med dense, Silty sand to sandy silt	36-37	40-60				15 - 17	20 - 23
3.5	70.7	94.7	0.7	1.1		397	Med dense, Sand to silty sand	40-42	40-60				22 - 25	30 - 33
4.0	45.0	58.9	0.5	0.8		348	Loose, Sand to silty sand	37-40	20-40				9 - 11	12 - 15
4.5	13.6	17.5	0.2	0.8		355	Loose, Silty sand to sandy silt	31-36	20-40				1 - 2	1 - 3
5.0	26.2	33.0	0.2	0.8		355	Loose, Silty sand to sandy silt	36-37	20-40				5 - 6	6 - 7
5.5	16.5	20.5	0.1	0.4		314	V loose, Silty sand to sandy silt	31-36	0-20				1 - 2	1 - 3
6.0	10.0	12.2	0.0	0.5		567	V loose, Silty sand to sandy silt	31-36	0-20				1 - 2	1 - 3
6.5	12.4	14.9	0.1	0.7		679	V loose, Silty sand to sandy silt	31-36	0-20				1 - 2	1 - 3
7.0	10.4	12.4	0.1	0.7		513	V loose, Silty sand to sandy silt	27-31	0-20				1 - 3	1 - 3
7.5	8.2	9.6	0.0	0.5		412	V loose, Silty sand to sandy silt	27-31	0-20				1 - 3	1 - 3
8.0	6.6	7.7	0.2	2.6		469	Stiff, Clayey silt to silty clay			10	1.23	0.34	1 - 3	1 - 3
8.5	5.9	6.8	0.2	2.1		486	Stiff, Clayey silt to silty clay			10	1.09	0.48	1 - 3	1 - 3
9.0	27.2	30.8	0.2	0.5		404	Loose, Silty sand to sandy silt	36-37	20-40				4 - 5	4 - 6
9.5	55.0	61.7	0.4	0.6		329	Loose, Sand to silty sand	37-40	20-40				11 - 13	12 - 15
10.0	74.7	83.0	0.5	0.7		315	Med dense, Sand to silty sand	40-42	40-60				15 - 18	17 - 20
10.5	41.4	45.8	0.3	0.6		292	Loose, Sand to silty sand	37-40	20-40				6 - 9	7 - 10
11.0	56.9	62.6	0.2	0.3		387	Loose, Sand to silty sand	40-42	20-40				9 - 11	10 - 12
11.5	67.5	73.9	0.2	0.3		374	Loose, Sand to silty sand	40-42	20-40				11 - 14	12 - 15
12.0	75.6	82.4	0.2	0.3		309	Loose, Sand to silty sand	40-42	20-40				14 - 16	15 - 17
12.5	66.7	72.4	0.3	0.4		274	Loose, Sand to silty sand	40-42	20-40				11 - 14	12 - 15
13.0	61.2	66.2	0.2	0.3		373	Loose, Sand to silty sand	40-42	20-40				9 - 11	10 - 12
13.5	71.0	76.4	0.2	0.3		334	Loose, Sand to silty sand	40-42	20-40				11 - 14	12 - 15
14.0	65.5	70.3	0.3	0.4		301	Loose, Sand to silty sand	40-42	20-40				11 - 14	12 - 15
14.5	63.5	67.8	0.2	0.3		285	Loose, Sand to silty sand	40-42	20-40				11 - 14	12 - 15
15.0	77.9	82.9	0.2	0.3		294	Loose, Sand to silty sand	40-42	20-40				14 - 16	15 - 17
15.5	63.5	67.3	0.4	0.5		303	Loose, Sand to silty sand	40-42	20-40				11 - 14	12 - 15
16.0	63.5	67.1	0.2	0.3		321	Loose, Sand to silty sand	40-42	20-40				9 - 11	10 - 12
16.5	78.9	83.0	0.4	0.5		321	Med dense, Sand to silty sand	40-42	40-60				16 - 19	17 - 20
17.0	63.0	66.0	0.3	0.4		322	Loose, Sand to silty sand	40-42	20-40				11 - 14	12 - 15
17.5	69.8	72.9	0.2	0.3		324	Loose, Sand to silty sand	40-42	20-40				11 - 14	12 - 15
18.0	72.1	75.0	0.4	0.5		305	Loose, Sand to silty sand	40-42	20-40				14 - 16	15 - 17
18.5	82.4	85.4	0.4	0.5		302	Med dense, Sand to silty sand	40-42	40-60				16 - 19	17 - 20
19.0	86.4	89.2	0.4	0.5		272	Med dense, Sand to silty sand	40-42	40-60				16 - 19	17 - 20
19.5	78.1	80.3	0.5	0.6		265	Med dense, Sand to silty sand	40-42	40-60				17 - 19	17 - 20
20.0	56.8	58.2	0.3	0.4		265	Loose, Sand to silty sand	37-40	20-40				10 - 12	10 - 12
20.5	84.3	86.1	0.3	0.3		272	Loose, Sand to silty sand	40-42	20-40				17 - 20	17 - 20

STRATIGRAPHICS

PAGE 2

JOB NO: '96-110-220
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp004

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED FRICTION		GENERATED PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)		SPT (N)	NORM SPT (Nf)
			FRICTION (TSF)	RATIO (%)							UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)		
21.0	87.5	89.1	0.5	0.6		261	Med dense, Sand to silty sand	40-42	40-60				20 - 23	20 - 23
21.5	87.5	88.8	0.6	0.7		259	Med dense, Sand to silty sand	40-42	40-60				20 - 23	20 - 23
22.0	82.2	83.1	0.6	0.7		262	Med dense, Sand to silty sand	40-42	40-60				20 - 23	20 - 23
22.5	91.4	92.1	0.7	0.6		272	Med dense, Sand to silty sand	40-42	40-60				20 - 23	20 - 23
23.0	123.0	123.6	0.8	0.6		272	Med dense, Sand to silty sand	40-42	40-60				30 - 33	30 - 33
23.5	134.1	134.4	1.0	0.7		270	Med dense, Sand to silty sand	40-42	40-60				33 - 40	33 - 40
24.0	98.4	98.3	1.0	0.8		276	Med dense, Sand to silty sand	40-42	40-60				23 - 30	23 - 30
24.5	65.3	65.0	0.6	0.8		284	Med dense, Sand to silty sand	37-40	40-60				15 - 17	15 - 17
25.0	93.3	92.6	0.8	0.9		336	Med dense, Sand to silty sand	40-42	40-60				23 - 30	23 - 30
25.5	62.2	61.5	0.7	0.9		296	Med dense, Sand to silty sand	37-40	40-60				15 - 17	15 - 17
26.0	15.5	15.3	0.8	1.8		337	Stiff, Sandy silt to clayey silt			15	1.86	1.55	3 - 4	3 - 4
26.5	88.5	87.0	0.5	0.5		465	Med dense, Sand to silty sand	40-42	40-60				17 - 20	17 - 20
27.0	101.9	99.9	0.7	0.6		260	Med dense, Sand to silty sand	40-42	40-60				23 - 31	23 - 30
27.5	123.7	121.0	0.7	0.5		266	Med dense, Sand to silty sand	40-42	40-60				31 - 34	30 - 33
28.0	152.1	148.3	1.1	0.7		254	Med dense, Sand to silty sand	40-42	40-60				41 - 47	40 - 46
28.5	139.1	135.2	1.3	0.9		245	Med dense, Sand to silty sand	40-42	40-60				41 - 47	40 - 46
29.0	107.9	104.6	1.1	0.9		255	Med dense, Sand to silty sand	40-42	40-60				31 - 34	30 - 33
29.5	72.5	70.0	0.9	1.0		285	Med dense, Sand to silty sand	37-40	40-60				18 - 21	17 - 20
30.0	28.3	27.2	0.8	1.7		333	Med dense, Silty sand to sandy silt	27-31	40-60				6 - 7	6 - 7
30.5	8.5	8.1	0.3	1.7		813	Stiff, Clayey silt to silty clay			10	1.33	0.56	1 - 3	1 - 3
31.0	12.6	12.0	0.3	2.2		970	Stiff, Clayey silt to silty clay			15	1.43	0.57	1 - 3	1 - 3
31.5	9.1	8.7	0.0	0.4		986	V loose, Silty sand to sandy silt	27-31	0-20				1 - 3	1 - 3
32.0	10.3	9.9	0.1	0.7		1004	V loose, Silty sand to sandy silt	27-31	0-20				1 - 3	1 - 3
32.5	10.2	9.7	0.2	2.1		1204	Stiff, Clayey silt to silty clay			15	1.10	0.49	1 - 3	1 - 3
33.0	9.9	9.4	0.1	1.2		1228	Stiff, Sandy silt to clayey silt			10	1.59	0.28	1 - 3	1 - 3
33.5	12.4	11.8	0.1	0.7		888	V loose, Silty sand to sandy silt	27-31	0-20				1 - 3	1 - 3
34.0	34.5	32.6	0.2	0.8		758	Loose, Silty sand to sandy silt	36-37	20-40				6 - 7	6 - 7

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STRATIGRAPHICS

PAGE 1

JOB NO: '96-110-220
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp005

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED GENERATED			SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)		SPT (N)	NORM SPT (Nf)
			FRICTION (TSF)	RATIO (%)	PORE WATER PRESSURE (TSF)						UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED SHEAR STRENGTH (KSF)		
1.0	209.3	337.2	3.0	1.3	-0.10	565	V dense, Sand to silty sand	42-46	80-100				+ 62	+ 100
1.5	121.9	185.7	2.9	1.7	0.00	382	Dense, Sand to silty sand	40-42	60-80				39 - 47	60 - 72
2.0	33.4	48.8	2.1	3.0	-0.10	403	V stiff, Sandy silt to sandy clay			25	2.66	4.11	16 - 21	23 - 30
2.5	55.4	78.2	1.4	1.9	-0.06	437	Dense, Silty sand to sandy silt	37-40	60-80				21 - 23	30 - 33
3.0	76.9	105.5	0.9	1.3	-0.10	528	Med dense, Sand to silty sand	40-42	40-60				24 - 29	33 - 40
3.5	58.2	78.0	0.9	1.3	0.00	551	Med dense, Silty sand to sandy silt	37-40	40-60				17 - 22	23 - 30
4.0	56.6	74.2	0.8	1.3	-0.06	499	Med dense, Silty sand to sandy silt	37-40	40-60				15 - 18	20 - 23
4.5	51.3	65.8	0.4	0.7	-0.04	492	Loose, Sand to silty sand	37-40	20-40				9 - 12	12 - 15
5.0	23.4	29.5	0.8	2.2	-0.09	644	V stiff, Sandy silt to sandy clay			20	2.31	1.57	8 - 10	10 - 12
5.5	25.2	31.3	0.8	3.3	-0.09	735	V stiff, Sandy clay to silty clay *			20	2.49	1.59	12 - 14	15 - 17
6.0	14.6	17.8	0.6	3.1	-0.02	874	Stiff, Sandy clay to silty clay *			15	1.90	1.15	5 - 6	6 - 7
6.5	21.8	26.2	0.6	1.8	-0.09	753	Med dense, Silty sand to sandy silt	27-31	40-60				5 - 6	6 - 7
7.0	45.4	54.0	0.1	0.3	0.00	552	Loose, Sand to silty sand	37-40	20-40				6 - 8	7 - 10
7.5	58.7	68.9	0.2	0.4	-0.03	518	Loose, Sand to silty sand	40-42	20-40				10 - 13	12 - 15
8.0	61.6	71.4	0.2	0.2	-0.06	443	Loose, Sand to silty sand	40-42	20-40				10 - 13	12 - 15
8.5	84.6	97.0	0.2	0.2	0.00	396	Med dense, Sand to silty sand	40-42	40-60				15 - 17	17 - 20
9.0	94.3	106.9	0.7	0.7	-0.06	297	Med dense, Sand to silty sand	40-42	40-60				20 - 26	23 - 30
9.5	87.8	98.6	0.7	0.8	-0.10	305	Med dense, Sand to silty sand	40-42	40-60				20 - 27	23 - 30
10.0	77.1	85.7	0.5	0.6	-0.03	257	Med dense, Sand to silty sand	40-42	40-60				18 - 21	20 - 23
10.5	46.8	51.8	0.5	0.8	-0.09	267	Loose, Sand to silty sand	37-40	20-40				9 - 11	10 - 12
11.0	9.2	10.2	0.5	2.2	-0.05	353	Stiff, Clayey silt to silty clay			15	1.15	0.96	1 - 3	1 - 3
11.5	5.1	5.5	0.1	1.9	0.00	1201	Soft, Clayey silt to silty clay			18	0.49	0.22	1 - 3	1 - 3
12.0	5.0	5.5	0.1	1.9	-0.06	1203	Soft, Clayey silt to silty clay			18	0.48	0.19	1 - 3	1 - 3
12.5	4.9	5.3	0.1	1.5	0.00	1205	Soft, Clayey silt to silty clay			18	0.46	0.15	1 - 3	1 - 3
13.0	5.4	5.9	0.1	1.3	-0.05	1222	Firm, Clayey silt to silty clay			18	0.52	0.14	1 - 3	1 - 3
13.5	5.6	6.0	0.1	1.7	-0.10	1214	Firm, Clayey silt to silty clay			10	0.95	0.20	1 - 3	1 - 3
14.0	5.5	5.9	0.1	1.1	-0.06	1204	Firm, Sandy silt to clayey silt			18	0.52	0.13	1 - 3	1 - 3
14.5	5.8	6.2	0.1	1.4	-0.03	1193	Firm, Clayey silt to silty clay			10	0.98	0.16	1 - 3	1 - 3
15.0	6.0	6.3	0.1	1.1	-0.04	1165	Stiff, Sandy silt to clayey silt			10	1.01	0.14	1 - 3	1 - 3
15.5	6.2	6.6	0.1	1.4	0.00	1175	Stiff, Clayey silt to silty clay			10	1.06	0.17	1 - 3	1 - 3
16.0	6.5	6.8	0.1	1.3	-0.10	1168	Stiff, Sandy silt to clayey silt			10	1.10	0.17	1 - 3	1 - 3
16.5	6.8	7.2	0.1	1.8	-0.07	1211	Stiff, Clayey silt to silty clay			10	1.16	0.25	1 - 3	1 - 3
17.0	6.8	7.1	0.1	1.8	-0.04	1263	Stiff, Clayey silt to silty clay			10	1.15	0.25	1 - 3	1 - 3
17.5	6.8	7.1	0.1	1.7	-0.10	1256	Stiff, Clayey silt to silty clay			10	1.16	0.24	1 - 3	1 - 3
18.0	7.1	7.3	0.1	1.9	0.00	1230	Stiff, Clayey silt to silty clay			10	1.20	0.27	1 - 3	1 - 3
18.5	7.1	7.4	0.1	1.6	-0.07	1256	Stiff, Clayey silt to silty clay			10	1.21	0.22	1 - 3	1 - 3
19.0	7.3	7.6	0.1	1.9	-0.08	1238	Stiff, Clayey silt to silty clay			10	1.24	0.28	1 - 3	1 - 3
19.5	7.5	7.7	0.2	2.1	-0.10	1252	Stiff, Clayey silt to silty clay			10	1.26	0.31	1 - 3	1 - 3
20.0	7.6	7.8	0.2	2.2	-0.10	1237	Stiff, Clayey silt to silty clay			10	1.28	0.33	1 - 3	1 - 3
20.5	8.0	8.2	0.2	2.0	-0.10	1249	Stiff, Clayey silt to silty clay			10	1.36	0.33	1 - 3	1 - 3

STRATIGRAPHICS

JOB NO: '96-110-220
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp005

PAGE 2

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED FRICTION		GENERATED PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)		SPT (N)	NORM SPT (Nf)
			FRICTION (TSF)	RATIO (%)							UNDRAINED SHEAR STRENGTH (KSF)	STRAIN SHEAR STRENGTH (KSF)		
21.0	8.7	8.8	0.2	2.0	-0.05	1179	Stiff, Clayey silt to silty clay	27-31	0-20	10	1.48	0.36	1 - 3	1 - 3
21.5	9.2	9.3	0.0	0.8	0.00	1143	V loose, Silty sand to sandy silt			15	1.26	0.81	1 - 3	1 - 3
22.0	10.8	10.9	0.4	3.0	0.00	754	Stiff, Clayey silt to silty clay			10	1.45	0.45	3 - 4	3 - 4
22.5	8.6	8.7	0.2	2.4	-0.10	1052	Stiff, Clayey silt to silty clay			10	1.46	0.47	1 - 3	1 - 3
23.0	8.7	8.7	0.2	2.7	-0.10	1043	Stiff, Clayey silt to silty clay			10	1.41	0.37	1 - 3	1 - 3
23.5	8.5	8.5	0.2	2.2	-0.10	997	Stiff, Clayey silt to silty clay			10	1.41	0.35	1 - 3	1 - 3
24.0	8.5	8.5	0.2	2.1	0.00	1020	Stiff, Clayey silt to silty clay			10	1.44	0.37	1 - 3	1 - 3
24.5	8.6	8.6	0.2	2.2	-0.06	1029	Stiff, Clayey silt to silty clay			10	1.31	0.37	1 - 3	1 - 3
25.0	8.1	8.0	0.2	2.2	0.00	934	Stiff, Clayey silt to silty clay			10	1.35	0.31	1 - 3	1 - 3
25.5	8.3	8.2	0.2	1.9	-0.01	936	Stiff, Clayey silt to silty clay			10	1.46	0.30	1 - 3	1 - 3
26.0	8.8	8.7	0.2	1.6	-0.05	1024	Stiff, Sandy silt to clayey silt			10	1.49	0.33	1 - 3	1 - 3
26.5	9.1	8.9	0.2	1.7	-0.10	1048	Stiff, Sandy silt to clayey silt			10	1.47	0.34	1 - 3	1 - 3
27.0	9.0	8.8	0.2	1.8	-0.10	1005	Stiff, Clayey silt to silty clay			10	1.60	0.44	1 - 3	1 - 3
27.5	9.6	9.4	0.2	2.3	-0.10	970	Stiff, Clayey silt to silty clay			10	1.49	0.46	1 - 3	1 - 3
28.0	9.1	8.9	0.2	2.5	-0.02	1014	Stiff, Clayey silt to silty clay			10	1.58	0.45	1 - 3	1 - 3
28.5	9.6	9.3	0.2	2.3	0.00	915	Stiff, Clayey silt to silty clay			10	1.56	0.42	1 - 3	1 - 3
29.0	9.6	9.3	0.2	2.1	-0.05	959	Stiff, Clayey silt to silty clay			15	1.30	0.53	1 - 3	1 - 3
29.5	11.5	11.2	0.3	2.4	-0.10	964	Stiff, Clayey silt to silty clay			15	1.12	0.63	1 - 3	1 - 3
30.0	10.2	9.8	0.3	2.8	-0.10	1160	Stiff, Clayey silt to silty clay			15	1.13	0.45	1 - 3	1 - 3
30.5	10.3	9.9	0.2	1.9	-0.04	1176	Stiff, Clayey silt to silty clay			15	2.00	0.72	4 - 6	4 - 6
31.0	16.9	16.2	0.4	2.5	-0.07	937	Stiff, Sandy clay to silty clay *			10	1.65	0.52	1 - 3	1 - 3
31.5	10.1	9.7	0.3	1.9	-0.01	1115	Stiff, Clayey silt to silty clay			15	1.21	0.71	3 - 4	3 - 4
32.0	11.0	10.5	0.4	2.8	-0.04	727	Stiff, Clayey silt to silty clay			15	1.25	0.57	1 - 3	1 - 3
32.5	11.3	10.8	0.3	2.4	0.00	934	Stiff, Clayey silt to silty clay			15	1.46	0.47	1 - 3	1 - 3
33.0	12.9	12.2	0.2	2.1	-0.10	930	Stiff, Clayey silt to silty clay			15	1.26	0.69	3 - 4	3 - 4
33.5	11.4	10.8	0.3	2.8	-0.06	1147	Stiff, Clayey silt to silty clay			15	1.29	0.53	1 - 3	1 - 3
34.0	11.7	11.0	0.3	2.3	-0.05	1050	Stiff, Clayey silt to silty clay			15	1.32	0.53	1 - 3	1 - 3
34.5	12.0	11.3	0.3	2.2	-0.10	1143	Stiff, Clayey silt to silty clay			15	1.35	0.56	1 - 3	1 - 3
35.0	12.2	11.5	0.3	2.3	-0.10	1155	Stiff, Clayey silt to silty clay			15	1.27	0.44	1 - 3	1 - 3
35.5	11.7	10.9	0.2	1.9	-0.03	1090	Stiff, Clayey silt to silty clay			15	1.28	0.49	1 - 3	1 - 3
36.0	11.8	11.0	0.2	2.1	-0.10	1124	Stiff, Clayey silt to silty clay			15	1.24	0.57	1 - 3	1 - 3
36.5	11.5	10.7	0.3	2.3	-0.10	1126	Stiff, Clayey silt to silty clay			15	1.33	0.61	3 - 4	3 - 4
37.0	12.2	11.4	0.3	2.5	0.00	1114	Stiff, Clayey silt to silty clay			15	1.30	0.52	1 - 3	1 - 3
37.5	12.0	11.1	0.3	2.2	-0.05	1142	Stiff, Clayey silt to silty clay			15	1.16	0.54	1 - 3	1 - 3
38.0	11.0	10.2	0.3	1.9	-0.05	1174	Stiff, Clayey silt to silty clay	36-37	20-40	15			4 - 7	4 - 6
38.5	28.2	26.0	0.4	0.6	-0.02	749	Loose, Silty sand to sandy silt						36 - 43	33 - 40
39.0	138.7	127.7	1.1	0.7	-0.01	335	Med dense, Sand to silty sand	40-42	40-60				50 - 65	46 - 60
39.5	185.6	170.4	1.7	1.0	-0.07	275	Dense, Sand to silty sand	42-46	60-80				33 - 36	30 - 33
40.0	86.5	79.3	2.7	1.7	-0.09	266	Dense, Silty sand to sandy silt	37-40	60-80				44 - 50	40 - 46
40.5	169.6	155.1	1.8	0.9	-0.03	395	Med dense, Sand to silty sand	40-42	40-60					

STRATIGRAPHICS

PAGE 3

JOB NO: '96-110-220
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp005

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED			GENERATED PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (Nf)
			FRICTION (TSF)	RATIO (%)											
41.0	228.1	208.0	3.0	1.3	-0.10	298	Dense, Sand to silty sand	42-46	60-80					66 - 79	60 - 72
41.5	255.1	232.2	3.8	1.5	-0.10	307	Dense, Sand to silty sand	42-46	60-80					79 - 109	72 - 99
42.0	245.0	222.5	3.9	1.5	0.00	310	Dense, Sand to silty sand	42-46	60-80					79 - 109	72 - 99
42.5	230.3	208.6	3.4	1.4	-0.09	313	Dense, Sand to silty sand	42-46	60-80					66 - 79	60 - 72
43.0	231.4	209.2	2.5	1.1	0.00	286	Dense, Sand to silty sand	42-46	60-80					66 - 80	60 - 72
43.5	204.8	184.7	3.0	1.3	-0.10	301	Dense, Sand to silty sand	40-42	60-80					67 - 80	60 - 72
44.0	133.2	119.9	2.3	1.4	-0.05	306	Dense, Sand to silty sand	40-42	60-80					44 - 51	40 - 46
44.5	64.5	57.9	1.6	1.6	0.00	352	Med dense, Silty sand to sandy silt	36-37	40-60					19 - 22	17 - 20
45.0	33.5	30.0	0.7	1.6	-0.10	545	Med dense, Silty sand to sandy silt	27-31	40-60					8 - 11	7 - 10
45.5	35.4	31.6	0.8	2.4	-0.05	542	V stiff, Sandy silt to sandy clay				20	3.27	1.67	11 - 13	10 - 12
46.0	34.7	30.9	0.8	2.3	-0.04	531	V stiff, Sandy silt to sandy clay				20	3.19	1.57	11 - 13	10 - 12
46.5	31.4	28.0	1.0	3.0	-0.07	505	V stiff, Sandy clay to silty clay *				20	2.86	2.02	13 - 17	12 - 15
47.0	29.6	26.3	0.5	1.7	-0.06	427	Loose, Silty sand to sandy silt	27-31	20-40					7 - 8	6 - 7
47.5	28.1	24.9	0.4	1.3	-0.05	394	Loose, Silty sand to sandy silt	27-31	20-40					5 - 7	4 - 6
48.0	27.2	24.1	0.4	1.3	-0.10	402	Loose, Silty sand to sandy silt	27-31	20-40					5 - 7	4 - 6
48.5	24.8	21.9	0.4	1.5	-0.01	436	Loose, Silty sand to sandy silt	27-31	20-40					5 - 7	4 - 6
49.0	25.1	22.1	0.4	1.6	-0.03	446	Loose, Silty sand to sandy silt	27-31	20-40					5 - 7	4 - 6
49.5	23.0	20.2	0.2	1.5	-0.04	471	Loose, Silty sand to sandy silt	27-31	20-40					5 - 7	4 - 6

NOTES: * Indicates lightly overconsolidated soil
 ** Indicates heavily overconsolidated or cemented soil

Mixed soils containing both granular and fine grained particles (e.g. clayey sands) may undergo partial drained failure during CPT. Both undrained and drained parameters can be estimated for these soils.

Structure rate of loading should be considered in choosing which strength parameters to use for design. Drained and undrained parameters must not be combined as such combination will result in significant overprediction of in situ shear strength.

STRATIGRAPHICS

JOB NO: '96-110-220
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp006

PAGE 1

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	FRICITION (TSF)	AVERAGED RATIO (%)	GENERATED PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (Nf)
1.0	46.1	74.2	0.4	0.8		105	Med dense, Sand to silty sand	40-42	40-60				11 - 12	17 - 20
1.5	25.2	38.4	0.3	0.9		103	Loose, Silty sand to sandy silt	36-37	20-40				5 - 7	7 - 10
2.0	15.2	22.3	0.2	1.0		241	Loose, Silty sand to sandy silt	31-36	20-40				2 - 3	3 - 4
2.5	19.1	27.0	0.5	2.2		156	Stiff, Sandy silt to sandy clay			20	1.90	0.92	5 - 7	7 - 10
3.0	22.9	31.5	1.1	4.8		274	Stiff, Silty clay to clay *			25	1.82	2.23	17 - 22	23 - 30
3.5	22.5	30.2	1.0	3.9		270	V stiff, Sandy clay to silty clay *			20	2.23	2.03	13 - 15	17 - 20
4.0	26.0	34.0	0.7	2.6		244	V stiff, Sandy silt to sandy clay			20	2.57	1.41	9 - 11	12 - 15
4.5	15.3	19.6	0.4	2.0		634	Stiff, Sandy silt to clayey silt			15	2.00	0.72	3 - 5	4 - 6
5.0	11.8	14.8	0.3	2.6		710	Stiff, Clayey silt to silty clay			15	1.53	0.70	3 - 5	4 - 6
5.5	12.3	15.3	0.4	2.7		728	Stiff, Sandy clay to silty clay *			15	1.60	0.72	3 - 5	4 - 6
6.0	14.4	17.6	0.4	2.6		641	Stiff, Sandy clay to silty clay *			15	1.88	0.74	5 - 6	6 - 7
6.5	14.0	16.9	0.4	2.2		560	Stiff, Sandy silt to clayey silt			15	1.81	0.72	3 - 5	4 - 6
7.0	20.4	24.2	0.6	2.6		651	Stiff, Sandy silt to sandy clay			20	1.99	1.14	6 - 8	7 - 10
7.5	28.3	33.2	0.3	1.5		444	Loose, Silty sand to sandy silt	27-31	20-40				6 - 9	7 - 10
8.0	17.8	20.7	0.4	0.8		526	Loose, Silty sand to sandy silt	31-36	20-40				3 - 3	3 - 4
8.5	58.1	66.6	0.2	0.4		406	Loose, Sand to silty sand	40-42	20-40				10 - 13	12 - 15
9.0	75.2	85.3	0.1	0.2		316	Loose, Sand to silty sand	40-42	20-40				13 - 15	15 - 17
9.5	76.6	86.0	0.3	0.3		255	Loose, Sand to silty sand	40-42	20-40				15 - 18	17 - 20
10.0	91.2	101.4	0.3	0.3		246	Med dense, Sand to silty sand	40-42	40-60				18 - 21	20 - 23
10.5	118.0	130.5	0.5	0.4		235	Med dense, Sand to silty sand	40-42	40-60				27 - 30	30 - 33
11.0	118.4	130.3	0.8	0.7		210	Med dense, Sand to silty sand	40-42	40-60				30 - 36	33 - 40
11.5	119.3	130.7	0.8	0.7		193	Med dense, Sand to silty sand	40-42	40-60				30 - 37	33 - 40
12.0	119.5	130.3	0.8	0.7		201	Med dense, Sand to silty sand	40-42	40-60				30 - 37	33 - 40
12.5	120.6	131.0	0.9	0.7		206	Med dense, Sand to silty sand	40-42	40-60				30 - 37	33 - 40
13.0	120.5	130.3	1.0	0.8		209	Med dense, Sand to silty sand	40-42	40-60				31 - 37	33 - 40
13.5	125.1	134.8	0.9	0.6		206	Med dense, Sand to silty sand	40-42	40-60				31 - 37	33 - 40
14.0	112.2	120.4	0.8	0.7		211	Med dense, Sand to silty sand	40-42	40-60				28 - 31	30 - 33
14.5	112.7	120.4	0.7	0.6		201	Med dense, Sand to silty sand	40-42	40-60				28 - 31	30 - 33
15.0	111.0	118.1	0.7	0.6		211	Med dense, Sand to silty sand	40-42	40-60				28 - 31	30 - 33
15.5	107.6	114.0	0.8	0.7		238	Med dense, Sand to silty sand	40-42	40-60				28 - 31	30 - 33
16.0	110.7	116.8	0.8	0.8		246	Med dense, Sand to silty sand	40-42	40-60				28 - 31	30 - 33
16.5	103.0	108.3	0.8	0.8		248	Med dense, Sand to silty sand	40-42	40-60				29 - 31	30 - 33
17.0	99.6	104.3	0.6	0.7		256	Med dense, Sand to silty sand	40-42	40-60				22 - 29	23 - 30
17.5	81.3	84.9	0.8	0.8		265	Med dense, Sand to silty sand	40-42	40-60				19 - 22	20 - 23
18.0	76.0	79.1	0.8	1.0		278	Med dense, Sand to silty sand	37-40	40-60				19 - 22	20 - 23
18.5	48.6	50.4	0.7	1.2		279	Med dense, Silty sand to sandy silt	36-37	40-60				12 - 14	12 - 15
19.0	20.3	20.9	0.7	2.2		355	V stiff, Sandy silt to sandy clay			15	2.55	1.36	6 - 7	6 - 7
19.5	18.8	19.4	0.4	2.4		470	V stiff, Sandy silt to sandy clay			15	2.35	0.89	6 - 7	6 - 7
20.0	16.0	16.4	0.2	0.7		569	V loose, Silty sand to sandy silt	31-36	0-20				1 - 3	1 - 3
20.5	36.3	37.1	0.6	2.0		477	Med dense, Silty sand to sandy silt	27-31	40-60				12 - 15	12 - 15

STRATIGRAPHICS

PAGE 2

JOB NO: '96-110-220
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp006

DEPTH (FT)	CONE (TSF)	NDRM CONE (TSF)	AVERAGED GENERATED			SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (N)
			FRICTION (TSF)	RATIO (%)	PORE WATER PRESSURE (TSF)									
21.0	17.7	18.1	0.5	0.9		695	Loose, Silty sand to sandy silt	31-36	20-40				1 - 3	1 - 3
21.5	85.0	86.3	0.5	0.6		249	Med dense, Sand to silty sand	40-42	40-60				17 - 20	17 - 20
22.0	89.8	90.8	0.5	0.6		212	Med dense, Sand to silty sand	40-42	40-60				20 - 23	20 - 23
22.5	74.1	74.7	0.5	0.6		219	Med dense, Sand to silty sand	40-42	40-60				15 - 17	15 - 17
23.0	63.3	63.6	0.6	0.9		254	Med dense, Sand to silty sand	37-40	40-60				15 - 17	15 - 17
23.5	50.3	50.3	0.8	1.2		302	Med dense, Silty sand to sandy silt	36-37	40-60				12 - 15	12 - 15
24.0	24.9	24.9	0.7	2.0		398	V stiff, Sandy silt to sandy clay			20	2.35	1.48	6 - 7	6 - 7
24.5	35.0	34.8	0.7	2.1		317	Med dense, Silty sand to sandy silt	27-31	40-60				10 - 12	10 - 12
25.0	10.6	10.5	0.5	2.5		624	Stiff, Clayey silt to silty clay			15	1.22	1.02	1 - 3	1 - 3
25.5	8.0	7.9	0.1	1.3		966	Stiff, Sandy silt to clayey silt			10	1.30	0.21	1 - 3	1 - 3
26.0	8.7	8.6	0.1	1.4		1022	Stiff, Sandy silt to clayey silt			10	1.44	0.26	1 - 3	1 - 3
26.5	10.3	10.1	0.2	1.5		1064	Stiff, Sandy silt to clayey silt			15	1.16	0.34	1 - 3	1 - 3
27.0	11.1	10.9	0.2	1.7		919	Stiff, Sandy silt to clayey silt			15	1.27	0.40	1 - 3	1 - 3
27.5	12.8	12.5	0.2	1.7		1109	Stiff, Sandy silt to clayey silt			15	1.49	0.44	1 - 3	1 - 3
28.0	13.6	13.3	0.3	1.9		1056	Stiff, Sandy silt to clayey silt			15	1.59	0.53	3 - 4	3 - 4
28.5	14.0	13.6	0.2	1.7		1130	Stiff, Sandy silt to clayey silt			15	1.64	0.47	1 - 3	1 - 3
29.0	14.2	13.7	0.2	1.6		1137	Stiff, Sandy silt to clayey silt			15	1.66	0.47	1 - 3	1 - 3
29.5	14.2	13.8	0.2	1.3		1108	Stiff, Sandy silt to clayey silt			15	1.66	0.40	1 - 3	1 - 3
30.0	16.0	15.4	0.3	1.9		1112	Stiff, Sandy silt to clayey silt			15	1.89	0.63	3 - 4	3 - 4
30.5	15.9	15.3	0.3	1.6		1161	Stiff, Sandy silt to clayey silt			15	1.88	0.53	3 - 4	3 - 4
31.0	16.1	15.5	0.4	2.1		1158	Stiff, Sandy silt to clayey silt			15	1.90	0.77	3 - 4	3 - 4
31.5	15.6	14.9	0.3	1.7		1098	Stiff, Sandy silt to clayey silt			15	1.83	0.53	3 - 4	3 - 4
32.0	15.6	14.9	0.2	1.4		1139	Stiff, Sandy silt to clayey silt			15	1.82	0.44	1 - 3	1 - 3
32.5	15.5	14.8	0.3	1.9		1184	Stiff, Sandy silt to clayey silt			15	1.81	0.58	3 - 4	3 - 4
33.0	15.3	14.5	0.3	1.6		1133	Stiff, Sandy silt to clayey silt			15	1.77	0.50	3 - 4	3 - 4
33.5	15.4	14.5	0.2	1.6		1168	Stiff, Sandy silt to clayey silt			15	1.78	0.49	3 - 4	3 - 4
34.0	14.9	14.1	0.3	1.8		1166	Stiff, Sandy silt to clayey silt			15	1.72	0.55	3 - 4	3 - 4
34.5	12.5	11.8	0.3	1.9		1123	Stiff, Sandy silt to clayey silt			15	1.39	0.51	1 - 3	1 - 3
35.0	11.7	10.9	0.2	1.6		1097	Stiff, Sandy silt to clayey silt			15	1.27	0.37	1 - 3	1 - 3
35.5	11.5	10.8	0.2	1.7		1144	Stiff, Sandy silt to clayey silt			15	1.25	0.39	1 - 3	1 - 3
36.0	10.8	10.1	0.2	1.7		1148	Stiff, Sandy silt to clayey silt			15	1.15	0.37	1 - 3	1 - 3
36.5	9.5	8.8	0.1	1.2		970	Stiff, Sandy silt to clayey silt			10	1.46	0.29	1 - 3	1 - 3
37.0	21.9	20.4	0.3	0.6		552	V loose, Silty sand to sandy silt	31-36	0-20				3 - 4	3 - 4
37.5	87.3	80.9	0.7	0.9		401	Med dense, Sand to silty sand	40-42	40-60				22 - 25	20 - 23
38.0	80.8	74.7	0.8	1.1		308	Med dense, Sand to silty sand	37-40	40-60				22 - 25	20 - 23
38.5	24.7	22.8	1.2	1.9		281	V stiff, Sandy silt to sandy clay			20	2.24	2.48	7 - 8	6 - 7
39.0	11.8	10.9	0.2	0.8		467	V loose, Silty sand to sandy silt	27-31	0-20				1 - 3	1 - 3
39.5	43.4	39.9	0.2	0.7		535	Loose, Sand to silty sand	36-37	20-40				7 - 8	6 - 7
40.0	63.9	58.5	0.5	1.1		832	Med dense, Silty sand to sandy silt	37-40	40-60				16 - 19	15 - 17

NOTES: * Indicates lightly overconsolidated soil
 ** Indicates heavily overconsolidated or cemented soil

Mixed soils containing both granular and fine grained particles (e.g. clayey sands) may undergo partial drained failure during CPT. Both undrained and drained parameters can be estimated for these soils.

Structure rate of loading should be considered in choosing which strength parameters to use for design. Drained and undrained parameters must not be combined as such combination will result in significant overprediction of in situ shear strength.

STRATIGRAPHICS

JOB NO: 96-110-220
 JOB NAME: ZONE A CHARLESTON NAVAL BASE, S.C.
 SOUNDING NO: CP007

PAGE 1

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED FRICTION (TSF)	RATIO (%)	GENERATED PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (Nf)
1.0	162.2	261.4	1.34	0.9		422	Dense, sand to silty sand	42-46	60-80				37 - 45	60 - 72
1.5	86.8	132.1	1.50	1.2		417	Dense, sand to silty sand	40-42	60-80				26 - 30	40 - 46
2.0	25.7	37.5	1.19	2.4		491	V stiff, sandy silt to sandy clay			25	2.04	2.39	10 - 12	15 - 17
2.5	22.2	31.3	0.91	3.9		346	Stiff, sandy clay to silty clay *			25	1.76	1.82	12 - 14	17 - 20
3.0	30.1	41.4	0.54	1.9		553	Med dense, silty sand to sandy silt	27-31	40-60				9 - 11	12 - 15
3.5	33.3	44.6	0.41	0.7		524	Loose, sand to silty sand	37-40	20-40				5 - 7	7 - 10
4.0	156.3	204.8	0.69	0.4		489	Med dense, sand to silty sand	42-46	40-60				35 - 46	46 - 60
4.5	160.6	206.3	0.56	0.5		478	Med dense, sand to silty sand	42-46	40-60				36 - 47	46 - 60
5.0	48.5	61.2	0.75	0.9		447	Med dense, sand to silty sand	37-40	40-60				10 - 12	12 - 15
5.5	79.0	98.1	2.44	1.8		890	Dense, silty sand to sandy silt	37-40	60-80				27 - 32	33 - 40
6.0	8.8	10.7	0.36	1.6		712	Stiff, sandy silt to clayey silt			15	1.12	0.71	1 - 2	1 - 3
6.5	3.9	4.7	0.06	1.6		1885	Soft, clayey silt to silty clay			18	0.39	0.13	1 - 2	1 - 3
7.0	2.8	3.3	0.11	3.2		1828	Soft, silty clay to clay			18	0.26	0.21	1 - 3	1 - 3
7.5	4.1	4.8	0.15	4.7		2006	Soft, clay			18	0.40	0.29	1 - 3	1 - 3
8.0	4.9	5.7	0.05	1.2		636	Soft, sandy silt to clayey silt			18	0.49	0.10	1 - 3	1 - 3
8.5	3.9	4.4	0.16	3.3		2384	Soft, silty clay to clay			18	0.37	0.31	1 - 3	1 - 3
9.0	2.9	3.3	0.04	0.8		2194	Soft, sensitive fine grained soil			18	0.27	0.08	0 - 1	0 - 1
9.5	23.3	26.2	0.09	0.1		1322	V loose, sand to silty sand	36-37	0-20				3 - 4	3 - 4
10.0	166.3	184.7	1.09	0.9		851	Dense, sand to silty sand	42-46	60-80				41 - 54	46 - 60
10.5	54.8	60.6	1.36	1.2		802	Med dense, silty sand to sandy silt	37-40	40-60				14 - 15	15 - 17
11.0	10.9	12.0	0.70	2.6		777	Stiff, clayey silt to silty clay			15	1.37	1.39	3 - 4	3 - 4
11.5	12.0	13.1	0.41	1.8		1059	Stiff, sandy silt to clayey silt			15	1.51	0.82	1 - 3	1 - 3
12.0	38.2	41.6	0.19	0.4		1109	Loose, sand to silty sand	37-40	20-40				6 - 6	6 - 7
12.5	112.5	122.2	0.45	0.3		755	Med dense, sand to silty sand	40-42	40-60				21 - 28	23 - 30
13.0	163.0	176.2	1.05	0.6		711	Med dense, sand to silty sand	42-46	40-60				37 - 43	40 - 46
13.5	172.7	186.0	0.97	0.5		544	Med dense, sand to silty sand	42-46	40-60				43 - 56	46 - 60
14.0	117.8	126.3	0.69	0.5		455	Med dense, sand to silty sand	40-42	40-60				28 - 31	30 - 33
14.5	94.6	101.0	0.41	0.4		484	Med dense, sand to silty sand	40-42	40-60				19 - 22	20 - 23
15.0	64.9	69.0	0.47	0.6		462	Loose, sand to silty sand	40-42	20-40				14 - 16	15 - 17
15.5	21.6	22.9	0.53	1.2		442	Loose, silty sand to sandy silt	27-31	20-40				4 - 6	4 - 6
16.0	6.0	6.3	0.33	3.0		722	Firm, silty clay to clay			10	1.00	0.66	1 - 3	1 - 3
16.5	5.0	5.2	0.13	2.6		887	Soft, silty clay to clay			18	0.44	0.27	1 - 3	1 - 3
17.0	4.8	5.0	0.17	3.1		1191	Soft, silty clay to clay			18	0.42	0.34	1 - 3	1 - 3
17.5	5.5	5.7	0.16	2.9		1111	Firm, silty clay to clay			10	0.89	0.32	1 - 3	1 - 3
18.0	5.3	5.5	0.15	2.8		1096	Firm, silty clay to clay			10	0.84	0.30	1 - 3	1 - 3
18.5	4.8	5.0	0.18	3.5		1386	Soft, silty clay to clay			18	0.41	0.35	1 - 3	1 - 3
19.0	4.6	4.8	0.15	3.1		1354	Soft, silty clay to clay			18	0.39	0.30	1 - 3	1 - 3
19.5	5.5	5.6	0.18	3.3		1355	Firm, silty clay to clay			10	0.86	0.35	1 - 3	1 - 3
20.0	5.0	5.1	0.18	3.3		1241	Soft, silty clay to clay			18	0.42	0.36	1 - 3	1 - 3
20.5	5.2	5.3	0.20	4.0		1287	Firm, silty clay to clay			10	0.79	0.41	1 - 3	1 - 3

STRATIGRAPHICS

JOB NO: 96-110-220
 JOB NAME: ZONE A CHARLESTON NAVAL BASE, S.C.
 SOUNDING NO: CP007

PAGE 2

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	FRICITION (TSF)	AVERAGED FRICITION RATIO (%)	GENERATED PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICITION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (Nf)
21.0	5.0	5.1	0.17	3.4		1256	Soft, silty clay to clay			18	0.42	0.35	1 - 3	1 - 3
21.5	5.3	5.3	0.14	2.7		1104	Soft, silty clay to clay			18	0.44	0.29	1 - 3	1 - 3
22.0	5.5	5.6	0.14	2.5		958	Firm, silty clay to clay			10	0.84	0.29	1 - 3	1 - 3
22.5	5.7	5.7	0.15	2.5		1104	Firm, silty clay to clay			10	0.86	0.29	1 - 3	1 - 3
23.0	5.8	5.8	0.16	2.6		1121	Firm, silty clay to clay			10	0.88	0.32	1 - 3	1 - 3
23.5	5.6	5.6	0.17	2.7		1146	Firm, silty clay to clay			10	0.83	0.34	1 - 3	1 - 3
24.0	6.3	6.3	0.17	2.6		1165	Firm, silty clay to clay			10	0.97	0.34	1 - 3	1 - 3
24.5	6.5	6.5	0.16	2.4		1093	Stiff, clayey silt to silty clay			10	1.01	0.32	1 - 3	1 - 3
25.0	6.7	6.6	0.17	2.4		1163	Stiff, clayey silt to silty clay			10	1.03	0.34	1 - 3	1 - 3
25.5	7.2	7.1	0.17	2.4		1013	Stiff, clayey silt to silty clay			10	1.13	0.34	1 - 3	1 - 3
26.0	7.1	7.0	0.18	2.5		1099	Stiff, clayey silt to silty clay			10	1.11	0.36	1 - 3	1 - 3
26.5	6.9	6.8	0.16	2.5		1166	Stiff, clayey silt to silty clay			10	1.07	0.33	1 - 3	1 - 3
27.0	7.5	7.3	0.19	2.4		1151	Stiff, clayey silt to silty clay			10	1.17	0.37	1 - 3	1 - 3
27.5	7.6	7.4	0.17	2.2		1004	Stiff, clayey silt to silty clay			10	1.18	0.34	1 - 3	1 - 3
28.0	7.9	7.7	0.20	2.0		1077	Stiff, clayey silt to silty clay			10	1.25	0.39	1 - 3	1 - 3
28.5	13.8	13.4	0.33	2.9		730	Stiff, sandy clay to silty clay *			15	1.61	0.66	4 - 6	4 - 6
29.0	8.8	8.6	0.21	2.1		867	Stiff, clayey silt to silty clay			10	1.42	0.43	1 - 3	1 - 3
29.5	8.5	8.2	0.22	2.6		1031	Stiff, clayey silt to silty clay			10	1.34	0.44	1 - 3	1 - 3
30.0	8.5	8.2	0.20	1.6		1052	Stiff, clayey silt to silty clay			10	1.34	0.41	1 - 3	1 - 3
30.5	12.0	11.5	0.43	3.3		478	Stiff, silty clay to clay			15	1.36	0.87	4 - 6	4 - 6
31.0	9.2	8.8	0.22	2.3		978	Stiff, clayey silt to silty clay			10	1.47	0.44	1 - 3	1 - 3
31.5	9.3	8.9	0.24	2.5		1025	Stiff, clayey silt to silty clay			10	1.49	0.48	1 - 3	1 - 3
32.0	9.5	9.1	0.22	2.4		1031	Stiff, clayey silt to silty clay			10	1.52	0.45	1 - 3	1 - 3
32.5	9.5	9.1	0.22	2.3		947	Stiff, clayey silt to silty clay			10	1.52	0.45	1 - 3	1 - 3
33.0	9.6	9.1	0.25	2.5		1040	Stiff, clayey silt to silty clay			10	1.52	0.49	1 - 3	1 - 3
33.5	10.8	10.2	0.24	2.2		967	Stiff, clayey silt to silty clay			15	1.17	0.47	1 - 3	1 - 3
34.0	10.6	10.0	0.25	2.2		1018	Stiff, clayey silt to silty clay			15	1.14	0.49	1 - 3	1 - 3
34.5	11.0	10.3	0.27	2.5		1092	Stiff, clayey silt to silty clay			15	1.19	0.55	1 - 3	1 - 3
35.0	10.8	10.1	0.25	2.2		969	Stiff, clayey silt to silty clay			15	1.16	0.51	1 - 3	1 - 3
35.5	10.8	10.1	0.27	2.5		1026	Stiff, clayey silt to silty clay			15	1.16	0.53	1 - 3	1 - 3
36.0	10.7	10.0	0.27	2.4		1075	Stiff, clayey silt to silty clay			15	1.14	0.53	1 - 3	1 - 3
36.5	11.2	10.5	0.27	2.3		1001	Stiff, clayey silt to silty clay			15	1.21	0.54	1 - 3	1 - 3
37.0	11.5	10.7	0.29	2.5		1070	Stiff, clayey silt to silty clay			15	1.24	0.58	1 - 3	1 - 3
37.5	11.6	10.7	0.29	2.5		1086	Stiff, clayey silt to silty clay			15	1.24	0.58	1 - 3	1 - 3
38.0	11.1	10.3	0.28	2.5		1042	Stiff, clayey silt to silty clay			15	1.18	0.56	1 - 3	1 - 3
38.5	11.4	10.5	0.28	2.4		1058	Stiff, clayey silt to silty clay			15	1.21	0.56	1 - 3	1 - 3
39.0	11.8	10.8	0.28	2.4		1064	Stiff, clayey silt to silty clay			15	1.25	0.57	1 - 3	1 - 3
39.5	11.9	10.9	0.29	2.4		1073	Stiff, clayey silt to silty clay			15	1.27	0.59	1 - 3	1 - 3
40.0	12.6	11.6	0.31	2.4		1073	Stiff, clayey silt to silty clay			15	1.36	0.62	3 - 4	3 - 4
40.5	12.8	11.7	0.33	2.6		1104	Stiff, clayey silt to silty clay			15	1.38	0.66	3 - 4	3 - 4

STRATIGRAPHICS

JOB NO: 96-110-220
 JOB NAME: ZONE A CHARLESTON NAVAL BASE, S.C.
 SOUNDING NO: CP007

PAGE 3

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	FRICION (TSF)	AVERAGED FRICION RATIO (%)	GENERATED PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (Nf)
41.0	12.9	11.8	0.33	2.5		1123	Stiff, clayey silt to silty clay			15	1.39	0.65	3 - 4	3 - 4
41.5	12.4	11.3	0.33	2.6		1053	Stiff, clayey silt to silty clay			15	1.32	0.66	3 - 4	3 - 4
42.0	12.0	10.9	0.30	2.5		1049	Stiff, clayey silt to silty clay			15	1.27	0.60	1 - 3	1 - 3
42.5	12.1	11.0	0.31	2.6		1046	Stiff, clayey silt to silty clay			15	1.27	0.62	3 - 4	3 - 4
43.0	12.1	11.0	0.34	2.7		1085	Stiff, clayey silt to silty clay			15	1.27	0.68	3 - 4	3 - 4
43.5	12.5	11.2	0.31	2.5		1087	Stiff, clayey silt to silty clay			15	1.31	0.62	3 - 4	3 - 4
44.0	11.8	10.6	0.31	2.5		1055	Stiff, clayey silt to silty clay			15	1.22	0.62	1 - 3	1 - 3
44.5	12.1	10.8	0.31	2.3		1068	Stiff, clayey silt to silty clay			15	1.25	0.62	1 - 3	1 - 3
45.0	16.2	14.5	0.42	2.8		1103	Stiff, sandy clay to silty clay *			15	1.80	0.83	4 - 7	4 - 6
45.5	13.1	11.7	0.39	2.6		1102	Stiff, clayey silt to silty clay			15	1.38	0.78	3 - 4	3 - 4
46.0	17.3	15.4	0.44	2.8		472	Stiff, sandy clay to silty clay *			15	1.94	0.88	4 - 7	4 - 6
46.5	11.4	10.2	0.33	2.6		964	Stiff, clayey silt to silty clay			15	1.15	0.67	1 - 3	1 - 3
47.0	11.7	10.4	0.30	2.5		1049	Stiff, clayey silt to silty clay			15	1.18	0.59	1 - 3	1 - 3
47.5	11.9	10.6	0.29	2.4		1041	Stiff, clayey silt to silty clay			15	1.21	0.59	1 - 3	1 - 3
48.0	12.2	10.8	0.30	2.4		1010	Stiff, clayey silt to silty clay			15	1.24	0.60	1 - 3	1 - 3
48.5	12.2	10.8	0.30	2.5		1006	Stiff, clayey silt to silty clay			15	1.24	0.60	1 - 3	1 - 3
49.0	11.2	9.8	0.27	2.4		964	Stiff, clayey silt to silty clay			15	1.09	0.54	1 - 3	1 - 3
49.5	10.6	9.3	0.30	2.7		1057	Stiff, clayey silt to silty clay			10	1.52	0.60	1 - 3	1 - 3
50.0	10.7	9.4	0.29	1.8		1040	Stiff, clayey silt to silty clay			10	1.54	0.58	1 - 3	1 - 3
50.5	46.3	40.5	0.28	0.6		609	Loose, sand to silty sand	37-40	20-40				7 - 8	6 - 7
51.0	37.3	32.6	0.63	1.3		423	Loose, silty sand to sandy silt	27-31	20-40				8 - 11	7 - 10
51.5	39.9	34.8	0.53	1.3		388	Loose, silty sand to sandy silt	36-37	20-40				8 - 11	7 - 10
52.0	36.0	31.3	0.44	1.1		403	Loose, silty sand to sandy silt	36-37	20-40				7 - 8	6 - 7
52.5	39.6	34.4	0.44	1.1		353	Loose, silty sand to sandy silt	36-37	20-40				8 - 12	7 - 10
53.0	40.5	35.1	0.48	1.2		359	Loose, silty sand to sandy silt	36-37	20-40				8 - 12	7 - 10
53.5	40.2	34.8	0.29	0.8		376	Loose, silty sand to sandy silt	36-37	20-40				7 - 8	6 - 7
54.0	41.1	35.5	0.49	1.1		410	Loose, silty sand to sandy silt	36-37	20-40				8 - 12	7 - 10
54.5	43.3	37.3	0.47	1.1		384	Loose, silty sand to sandy silt	36-37	20-40				8 - 12	7 - 10
55.0	33.7	29.0	0.49	1.3		403	Loose, silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
55.5	29.1	24.9	0.45	1.4		472	Loose, silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
56.0	32.1	27.5	0.46	1.4		503	Loose, silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
56.5	32.6	27.8	0.47	1.4		521	Loose, silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
57.0	31.0	26.5	0.44	1.4		580	Loose, silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
57.5	33.2	28.3	0.47	1.4		566	Loose, silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
58.0	34.6	29.4	0.48	1.4		569	Loose, silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
58.5	34.2	29.0	0.45	1.3		574	Loose, silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
59.0	30.1	25.5	0.39	1.2		615	Loose, silty sand to sandy silt	27-31	20-40				5 - 7	4 - 6
59.5	35.6	30.1	0.51	1.5		539	Loose, silty sand to sandy silt	27-31	20-40				8 - 12	7 - 10
60.0	29.9	25.2	0.45	1.4		567	Loose, silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
60.5	29.3	24.7	0.40	1.4		583	Loose, silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7

STRATIGRAPHICS

PAGE 4

JOB NO: 96-110-220
 JOB NAME: ZONE A CHARLESTON NAVAL BASE, S.C.
 SOUNDING NO: CP007

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	FRICION (TSF)	AVERAGED FRICION RATIO (%)	GENERATED PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICION ANGLE (DEG)	RELATIVE DENSITY (%)	Hc	UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (Nf)
61.0	28.1	23.7	0.45	1.6		616	Loose, silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
61.5	27.9	23.4	0.43	1.5		621	Loose, silty sand to sandy silt	27-31	20-40				5 - 7	4 - 6
62.0	27.2	22.8	0.42	1.6		621	Loose, silty sand to sandy silt	27-31	20-40				5 - 7	4 - 6
62.5	26.6	22.2	0.47	1.7		653	Loose, silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
63.0	27.4	22.8	0.48	1.8		703	Loose, silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
63.5	27.1	22.6	0.51	1.8		751	V stiff, sandy silt to sandy clay			15	3.11	1.02	7 - 8	6 - 7
64.0	29.1	24.2	0.56	1.9		739	V stiff, sandy silt to sandy clay			20	2.53	1.12	7 - 8	6 - 7
64.5	29.5	24.5	0.57	1.9		777	V stiff, sandy silt to sandy clay			20	2.56	1.15	7 - 8	6 - 7
65.0	29.4	24.4	0.56	1.9		753	V stiff, sandy silt to sandy clay			20	2.55	1.12	7 - 8	6 - 7
65.5	30.7	25.4	0.57	1.9		723	Med dense, silty sand to sandy silt	27-31	40-60				7 - 8	6 - 7
66.0	29.9	24.7	0.56	1.8		729	V stiff, sandy silt to sandy clay			20	2.59	1.12	7 - 8	6 - 7
66.5	30.1	24.8	0.56	1.9		722	V stiff, sandy silt to sandy clay			20	2.61	1.12	7 - 8	6 - 7
67.0	29.1	24.0	0.56	1.9		706	V stiff, sandy silt to sandy clay			20	2.51	1.12	7 - 8	6 - 7

NOTES: * Indicates lightly overconsolidated soil
 ** Indicates heavily overconsolidated or cemented soil

Mixed soils containing both granular and fine grained particles (e.g. clayey sands) may undergo partial drained failure during CPT. Both undrained and drained parameters can be estimated for these soils.

Structure rate of loading should be considered in choosing which strength parameters to use for design. Drained and undrained parameters must not be combined as such combination will result in significant overprediction of in situ shear strength.

STRATIGRAPHICS

PAGE 1

JOB NO: '96-110-220
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp008

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED GENERATED			SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (Nf)
			FRICTION (TSF)	RATIO (%)	PORE WATER PRESSURE (TSF)									
1.0	152.8	246.1	2.6	1.0		390	Dense, Sand to silty sand	42-46	60-80				37 - 45	60 - 72
1.5	40.3	61.3	0.9	1.1		324	Med dense, Silty sand to sandy silt	37-40	40-60				10 - 11	15 - 17
2.0	12.3	18.0	0.7	3.2		586	Stiff, Sandy clay to silty clay *			15	1.63	1.33	4 - 5	6 - 7
2.5	9.9	14.0	0.3	3.0		747	Stiff, Sandy clay to silty clay *			15	1.30	0.70	3 - 4	4 - 6
3.0	11.9	16.3	0.2	1.4		617	Loose, Silty sand to sandy silt	27-31	20-40				2 - 3	3 - 4
3.5	17.5	23.4	0.7	3.9		651	Stiff, Silty clay to clay *			20	1.72	1.30	9 - 11	12 - 15
4.0	16.0	20.9	0.9	4.9		579	Stiff, Silty clay to clay *			20	1.57	1.70	11 - 13	15 - 17
4.5	13.9	17.8	0.7	4.9		695	Stiff, Silty clay to clay *			15	1.81	1.48	8 - 9	10 - 12
5.0	14.3	18.1	0.6	4.5		623	Stiff, Silty clay to clay *			15	1.87	1.27	8 - 10	10 - 12
5.5	13.4	16.6	0.5	1.9		478	Stiff, Sandy silt to clayey silt			15	1.74	0.92	2 - 3	3 - 4
6.0	43.1	52.7	0.4	0.9		274	Loose, Sand to silty sand	37-40	20-40				8 - 10	10 - 12
6.5	46.8	56.4	0.5	1.0		253	Med dense, Silty sand to sandy silt	37-40	40-60				10 - 12	12 - 15
7.0	31.0	36.9	0.3	0.7		248	Loose, Silty sand to sandy silt	36-37	20-40				5 - 6	6 - 7
7.5	12.3	14.5	0.5	2.7		322	Stiff, Clayey silt to silty clay			15	1.58	1.08	3 - 5	4 - 6
8.0	16.8	19.5	0.5	2.4		392	V stiff, Sandy silt to sandy clay			15	2.18	0.99	5 - 6	6 - 7
8.5	17.3	19.8	0.7	3.3		396	V stiff, Sandy clay to silty clay *			15	2.24	1.42	6 - 9	7 - 10
9.0	19.4	22.0	0.4	1.6		360	Loose, Silty sand to sandy silt	27-31	20-40				4 - 5	4 - 6
9.5	35.3	39.6	0.2	0.5		388	Loose, Sand to silty sand	37-40	20-40				5 - 6	6 - 7
10.0	46.3	51.4	0.1	0.1		259	Loose, Sand to silty sand	37-40	20-40				6 - 9	7 - 10
10.5	82.0	90.6	0.2	0.2		223	Loose, Sand to silty sand	40-42	20-40				15 - 18	17 - 20
11.0	78.5	86.4	0.4	0.5		195	Med dense, Sand to silty sand	40-42	40-60				15 - 18	17 - 20
11.5	30.8	33.7	0.9	1.6		287	Med dense, Silty sand to sandy silt	27-31	40-60				6 - 9	7 - 10
12.0	43.6	47.5	0.5	0.8		583	Loose, Sand to silty sand	37-40	20-40				6 - 9	7 - 10
12.5	53.4	58.0	1.0	1.7		336	Med dense, Silty sand to sandy silt	36-37	40-60				16 - 18	17 - 20
13.0	53.7	58.1	0.9	1.5		679	Med dense, Silty sand to sandy silt	36-37	40-60				16 - 18	17 - 20
13.5	59.3	63.9	1.2	2.1		724	Dense, Silty sand to sandy silt	36-37	60-80				21 - 28	23 - 30
14.0	28.1	30.1	1.1	2.9		796	V stiff, Sandy clay to silty clay *			20	2.73	2.12	11 - 14	12 - 15
14.5	16.4	17.6	0.6	2.2		1385	V stiff, Sandy silt to clayey silt			15	2.08	1.16	4 - 6	4 - 6
15.0	14.2	15.1	0.3	1.8		1945	Stiff, Sandy silt to clayey silt			15	1.77	0.51	3 - 4	3 - 4
15.5	14.6	15.5	0.3	1.7		1942	Stiff, Sandy silt to clayey silt			15	1.82	0.53	3 - 4	3 - 4
16.0	14.7	15.6	0.3	2.2		1289	Stiff, Sandy silt to clayey silt			15	1.84	0.66	4 - 6	4 - 6
16.5	13.9	14.6	0.3	1.5		1886	Stiff, Sandy silt to clayey silt			15	1.72	0.69	1 - 3	1 - 3
17.0	36.9	38.6	0.7	0.8		1714	Loose, Silty sand to sandy silt	36-37	20-40				7 - 10	7 - 10
17.5	106.9	111.6	1.1	1.2		432	Med dense, Sand to silty sand	40-42	40-60				32 - 38	33 - 40
18.0	36.6	38.1	1.7	2.1		273	Med dense, Silty sand to sandy silt	27-31	40-60				12 - 14	12 - 15
18.5	15.7	16.3	0.4	1.2		524	Loose, Silty sand to sandy silt	27-31	20-40				1 - 3	1 - 3
19.0	63.4	65.4	1.0	1.9		428	Med dense, Silty sand to sandy silt	36-37	40-60				22 - 29	23 - 30
19.5	67.5	69.4	1.2	1.0		528	Med dense, Sand to silty sand	37-40	40-60				17 - 19	17 - 20
20.0	152.5	156.3	1.3	0.9		261	Dense, Sand to silty sand	40-42	60-80				45 - 59	46 - 60
20.5	144.0	147.2	1.5	1.0		194	Dense, Sand to silty sand	40-42	60-80				39 - 45	40 - 46

STRATIGRAPHICS

JOB NO: '96-110-220
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp008

PAGE 2

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	FRICION (TSF)	GENERATED RATIO (%)	PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (Nf)
21.0	117.4	119.5	1.5	1.1		185	Med dense, Sand to silty sand	40-42	40-60				32 - 39	33 - 40
21.5	112.1	113.8	1.4	1.1		193	Med dense, Sand to silty sand	40-42	40-60				33 - 39	33 - 40
22.0	94.6	95.7	1.0	1.0		190	Med dense, Sand to silty sand	40-42	40-60				23 - 30	23 - 30
22.5	22.6	22.8	1.4	2.3		199	V stiff, Sandy silt to sandy clay			20	2.12	2.89	6 - 7	6 - 7
23.0	11.0	11.1	0.3	1.8		420	Stiff, Sandy silt to clayey silt			15	1.29	0.51	1 - 3	1 - 3
23.5	11.4	11.4	0.2	0.8		762	V loose, Silty sand to sandy silt	27-31	0-20				1 - 3	1 - 3
24.0	18.5	18.5	1.0	3.3		386	V stiff, Sandy clay to silty clay *			15	2.27	1.95	7 - 10	7 - 10
24.5	12.6	12.6	0.4	2.4		931	Stiff, Clayey silt to silty clay			15	1.49	0.86	3 - 4	3 - 4
25.0	34.9	34.6	0.4	0.7		1057	Loose, Silty sand to sandy silt	36-37	20-40				6 - 7	6 - 7
25.5	73.1	72.3	0.7	0.7		347	Med dense, Sand to silty sand	40-42	40-60				17 - 20	17 - 20
26.0	107.5	106.1	1.1	1.0		261	Med dense, Sand to silty sand	40-42	40-60				30 - 33	30 - 33
26.5	102.5	100.8	1.4	1.3		263	Med dense, Sand to silty sand	37-40	40-60				31 - 34	30 - 33
27.0	115.8	113.6	1.2	0.9		259	Med dense, Sand to silty sand	40-42	40-60				31 - 34	30 - 33
27.5	164.9	161.2	2.0	1.0		236	Dense, Sand to silty sand	40-42	60-80				47 - 61	46 - 60
28.0	227.0	221.3	3.3	1.4		239	Dense, Sand to silty sand	42-46	60-80				74 - 102	72 - 99
28.5	239.4	232.7	3.7	1.5		239	V dense, Sand to silty sand	42-46	80-100				74 - 102	72 - 99
29.0	219.0	212.3	3.0	1.3		228	Dense, Sand to silty sand	42-46	60-80				62 - 74	60 - 72
29.5	179.0	173.0	2.7	1.3		230	Dense, Sand to silty sand	40-42	60-80				62 - 74	60 - 72
30.0	120.6	116.3	1.7	1.1		242	Med dense, Sand to silty sand	40-42	40-60				34 - 41	33 - 40
30.5	153.6	147.6	1.4	0.9		245	Med dense, Sand to silty sand	40-42	40-60				42 - 48	40 - 46
31.0	158.8	152.3	2.0	1.2		239	Dense, Sand to silty sand	40-42	60-80				48 - 63	46 - 60
31.5	143.9	137.6	1.8	1.2		233	Dense, Sand to silty sand	40-42	60-80				42 - 48	40 - 46
32.0	136.0	129.7	1.7	1.2		228	Dense, Sand to silty sand	40-42	60-80				42 - 48	40 - 46
32.5	138.7	132.0	1.8	1.3		228	Dense, Sand to silty sand	40-42	60-80				42 - 48	40 - 46
33.0	126.9	120.4	1.7	1.3		228	Dense, Sand to silty sand	40-42	60-80				42 - 48	40 - 46
33.5	111.4	105.4	1.4	1.2		239	Med dense, Sand to silty sand	40-42	40-60				32 - 35	30 - 33
34.0	135.3	127.6	1.3	0.8		256	Med dense, Sand to silty sand	40-42	40-60				35 - 42	33 - 40
34.5	219.3	206.4	2.3	1.1		280	Dense, Sand to silty sand	42-46	60-80				64 - 76	60 - 72
35.0	170.5	160.1	2.5	1.2		234	Dense, Sand to silty sand	40-42	60-80				49 - 64	46 - 60
35.5	165.0	154.6	2.0	1.2		239	Dense, Sand to silty sand	40-42	60-80				49 - 64	46 - 60
36.0	151.0	141.1	1.8	1.1		238	Dense, Sand to silty sand	40-42	60-80				43 - 49	40 - 46
36.5	146.5	136.5	1.6	1.1		239	Dense, Sand to silty sand	40-42	60-80				43 - 49	40 - 46
37.0	128.5	119.4	1.5	1.1		241	Med dense, Sand to silty sand	40-42	40-60				35 - 43	33 - 40
37.5	127.8	118.5	1.4	1.0		237	Med dense, Sand to silty sand	40-42	40-60				36 - 43	33 - 40
38.0	164.1	151.8	1.8	1.1		281	Dense, Sand to silty sand	40-42	60-80				50 - 65	46 - 60
38.5	146.5	135.2	1.9	1.2		263	Dense, Sand to silty sand	40-42	60-80				43 - 50	40 - 46
39.0	101.6	93.5	1.3	1.1		252	Med dense, Sand to silty sand	40-42	40-60				25 - 33	23 - 30
39.5	145.7	133.8	1.5	1.1		321	Dense, Sand to silty sand	40-42	60-80				44 - 50	40 - 46
40.0	97.2	89.0	1.6	1.2		288	Med dense, Sand to silty sand	37-40	40-60				25 - 33	23 - 30
40.5	80.7	73.8	1.5	1.6		332	Med dense, Silty sand to sandy silt	37-40	40-60				25 - 33	23 - 30

STRATIGRAPHICS

PAGE 3

JOB NO: '96-110-220
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp008

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED FRICTION (TSF)	GENERATED FRICTION RATIO (%)	PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (Nf)
41.0	33.7	30.7	1.1	1.4		751	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
41.5	126.9	115.5	1.2	0.9		334	Med dense, Sand to silty sand	40-42	40-60				33 - 36	30 - 33
42.0	146.1	132.6	1.4	0.8		273	Med dense, Sand to silty sand	40-42	40-60				36 - 44	33 - 40
42.5	182.1	165.0	1.9	1.0		272	Dense, Sand to silty sand	42-46	60-80				51 - 66	46 - 60
43.0	178.2	161.1	1.9	1.0		277	Dense, Sand to silty sand	40-42	60-80				51 - 66	46 - 60
43.5	174.1	157.0	1.8	0.9		279	Dense, Sand to silty sand	40-42	60-80				51 - 67	46 - 60
44.0	211.7	190.5	2.5	1.2		292	Dense, Sand to silty sand	42-46	60-80				67 - 80	60 - 72
44.5	170.4	153.0	2.4	1.2		331	Dense, Sand to silty sand	40-42	60-80				51 - 67	46 - 60
45.0	99.8	89.4	1.6	1.3		373	Med dense, Sand to silty sand	37-40	40-60				26 - 33	23 - 30
45.5	60.1	53.7	1.9	2.2		425	Dense, Silty sand to sandy silt	27-31	60-80				22 - 26	20 - 23
46.0	21.7	19.3	0.7	2.2		590	V stiff, Sandy silt to sandy clay			15	2.52	1.50	4 - 7	4 - 6
46.5	51.7	46.0	0.5	0.9		879	Loose, Silty sand to sandy silt	37-40	20-40				8 - 11	7 - 10
47.0	46.4	41.2	0.7	0.8		546	Loose, Silty sand to sandy silt	36-37	20-40				8 - 11	7 - 10
47.5	109.7	97.2	0.3	0.3		408	Med dense, Sand to silty sand	40-42	40-60				19 - 23	17 - 20
48.0	125.1	110.6	0.3	0.2		402	Med dense, Sand to silty sand	40-42	40-60				23 - 26	20 - 23
48.5	200.0	176.5	0.8	0.4		420	Med dense, Sand to silty sand	42-46	40-60				45 - 52	40 - 46
49.0	248.2	218.6	3.1	1.1		447	Dense, Sand to silty sand	42-46	60-80				68 - 82	60 - 72
49.5	288.9	254.0	4.1	1.4		501	V dense, Sand to silty sand	42-46	80-100				82 - 113	72 - 99
50.0	259.3	227.5	3.6	1.3		524	Dense, Sand to silty sand	42-46	60-80				82 - 113	72 - 99
50.5	172.0	150.5	2.4	1.1		620	Dense, Sand to silty sand	40-42	60-80				53 - 69	46 - 60
51.0	74.7	65.3	1.1	1.0		829	Med dense, Sand to silty sand	37-40	40-60				17 - 19	15 - 17
51.5	63.7	55.5	1.0	1.1		1687	Med dense, Silty sand to sandy silt	37-40	40-60				14 - 17	12 - 15
52.0	104.1	90.6	1.7	1.6		2019	Dense, Silty sand to sandy silt	37-40	60-80				34 - 38	30 - 33
52.5	37.0	32.2	0.8	1.3		2520	Loose, Silty sand to sandy silt	27-31	20-40				8 - 12	7 - 10
53.0	35.7	31.0	0.5	1.2		3151	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
53.5	38.9	33.7	0.4	0.9		3331	Loose, Silty sand to sandy silt	36-37	20-40				7 - 8	6 - 7
54.0	37.1	32.1	0.3	0.8		3729	Loose, Silty sand to sandy silt	36-37	20-40				7 - 8	6 - 7
54.5	37.5	32.3	-0.3	0.7		3703	Loose, Silty sand to sandy silt	36-37	20-40				7 - 8	6 - 7

NOTES: * Indicates lightly overconsolidated soil
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STRATIGRAPHICS

PAGE 1

JOB NO: '96-110-220
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp009

JOB NAME:		Zone A Charleston Naval Base, S.C.						UNDRAINED LARGE							
SOUNDING NO:		cp009						DRAINED		UNDRAINED		SHEAR		STRAIN	
DEPTH	CONE	NORM	FRICTION	AVERAGED	GENERATED	SOIL	SOIL TYPE	FRICTION	RELATIVE	Nc	SHEAR	SHEAR	SPT	NORM	
(FT)	(TSF)	CONE	(TSF)	RATIO	PRESSURE	CONDUCTIVITY		ANGLE	DENSITY		STRENGTH	STRENGTH	(N)	SPT	
		(TSF)	(TSF)	(%)	(TSF)	(uS/cm)		(DEG)	(%)		(KSF)	(KSF)		(N1)	
1.00	PREPUNCH														
1.50	PREPUNCH														
2.00	PREPUNCH														
2.50	PREPUNCH														
3.00	PREPUNCH														
3.50	PREPUNCH														
4.00	PREPUNCH														
4.50	PREPUNCH														
5.00	PREPUNCH														
5.5	37.5	46.6	0.4	0.9		311	Loose, Silty sand to sandy silt	37-40	20-40				6 - 8	7 - 10	
6.0	35.4	43.2	0.2	0.3		392	Loose, Sand to silty sand	37-40	20-40				5 - 6	6 - 7	
6.5	69.1	83.2	0.3	0.4		394	Loose, Sand to silty sand	40-42	20-40				14 - 17	17 - 20	
7.0	73.1	86.9	0.5	0.7		319	Med dense, Sand to silty sand	40-42	40-60				17 - 19	20 - 23	
7.5	41.4	48.6	0.6	1.1		309	Loose, Silty sand to sandy silt	36-37	20-40				9 - 10	10 - 12	
8.0	18.3	21.2	0.9	3.4		666	Stiff, Sandy clay to silty clay *			20	1.78	1.74	9 - 10	10 - 12	
8.5	17.4	19.9	1.1	4.3		737	Stiff, Silty clay to clay *			20	1.69	2.28	9 - 10	10 - 12	
9.0	53.9	61.2	0.6	0.9		507	Med dense, Sand to silty sand	37-40	40-60				13 - 15	15 - 17	
9.5	77.7	87.2	0.1	0.2		365	Loose, Sand to silty sand	40-42	20-40				13 - 15	15 - 17	
10.0	77.4	86.0	0.5	0.6		300	Med dense, Sand to silty sand	40-42	40-60				18 - 21	20 - 23	
10.5	69.5	76.9	0.5	0.7		297	Med dense, Sand to silty sand	40-42	40-60				15 - 18	17 - 20	
11.0	90.0	99.1	0.6	0.7		296	Med dense, Sand to silty sand	40-42	40-60				21 - 27	23 - 30	
11.5	60.4	66.2	0.1	0.1		329	Loose, Sand to silty sand	40-42	20-40				9 - 11	10 - 12	
12.0	77.6	84.6	0.1	0.2		297	Loose, Sand to silty sand	40-42	20-40				14 - 16	15 - 17	
12.5	65.2	70.8	0.2	0.2		279	Loose, Sand to silty sand	40-42	20-40				11 - 14	12 - 15	
13.0	75.7	81.9	0.4	0.4		309	Loose, Sand to silty sand	40-42	20-40				14 - 16	15 - 17	
13.5	106.3	114.5	0.7	0.6		259	Med dense, Sand to silty sand	40-42	40-60				28 - 31	30 - 33	
14.0	102.0	109.4	0.9	0.8		253	Med dense, Sand to silty sand	40-42	40-60				28 - 31	30 - 33	
14.5	110.2	117.8	1.1	1.0		233	Med dense, Sand to silty sand	40-42	40-60				31 - 37	33 - 40	
15.0	109.4	116.3	1.1	1.0		174	Med dense, Sand to silty sand	40-42	40-60				31 - 38	33 - 40	
15.5	102.5	108.6	1.0	1.0		194	Med dense, Sand to silty sand	40-42	40-60				28 - 31	30 - 33	
16.0	101.6	107.2	0.9	0.9		243	Med dense, Sand to silty sand	40-42	40-60				28 - 31	30 - 33	
16.5	69.9	73.5	0.9	1.0		228	Med dense, Sand to silty sand	37-40	40-60				19 - 22	20 - 23	
17.0	56.9	59.6	0.4	0.7		246	Loose, Sand to silty sand	37-40	20-40				11 - 14	12 - 15	
17.5	75.2	78.5	0.3	0.4		282	Loose, Sand to silty sand	40-42	20-40				14 - 16	15 - 17	
18.0	101.3	105.3	0.9	0.9		186	Med dense, Sand to silty sand	40-42	40-60				29 - 32	30 - 33	
18.5	105.8	109.6	1.0	0.9		179	Med dense, Sand to silty sand	40-42	40-60				29 - 32	30 - 33	
19.0	114.0	117.7	1.0	0.9		174	Med dense, Sand to silty sand	40-42	40-60				32 - 39	33 - 40	
19.5	121.4	124.9	1.2	1.0		184	Med dense, Sand to silty sand	40-42	40-60				32 - 39	33 - 40	
20.0	112.5	115.4	1.2	1.0		185	Med dense, Sand to silty sand	40-42	40-60				32 - 39	33 - 40	
20.5	83.6	85.4	1.0	0.9		197	Med dense, Sand to silty sand	40-42	40-60				20 - 23	20 - 23	

STRATIGRAPHICS

JOB NO: '96-110-220
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp009

PAGE 2

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED FRICTION (TSF)	RATIO (%)	GENERATED PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (Nf)
21.0	118.8	121.0	1.1	0.9		226	Med dense, Sand to silty sand	40-42	40-60				32 - 39	33 - 40
21.5	122.5	124.4	1.3	1.0		171	Med dense, Sand to silty sand	40-42	40-60				33 - 39	33 - 40
22.0	96.2	97.3	1.1	1.1		185	Med dense, Sand to silty sand	40-42	40-60				30 - 33	30 - 33
22.5	72.7	73.3	1.0	1.2		235	Med dense, Silty sand to sandy silt	37-40	40-60				20 - 23	20 - 23
23.0	93.1	93.5	0.9	1.0		333	Med dense, Sand to silty sand	40-42	40-60				23 - 30	23 - 30
23.5	67.8	68.0	1.0	1.2		190	Med dense, Silty sand to sandy silt	37-40	40-60				17 - 20	17 - 20
24.0	93.6	93.5	0.7	0.7		368	Med dense, Sand to silty sand	40-42	40-60				20 - 23	20 - 23
24.5	120.2	119.7	1.2	0.9		196	Med dense, Sand to silty sand	40-42	40-60				33 - 40	33 - 40
25.0	130.0	129.1	1.3	1.0		179	Med dense, Sand to silty sand	40-42	40-60				33 - 40	33 - 40
25.5	138.5	137.1	1.4	1.0		177	Med dense, Sand to silty sand	40-42	40-60				40 - 46	40 - 46
26.0	148.3	146.3	1.4	1.0		179	Med dense, Sand to silty sand	40-42	40-60				41 - 47	40 - 46
26.5	129.4	127.2	1.3	1.0		179	Med dense, Sand to silty sand	40-42	40-60				34 - 41	33 - 40
27.0	107.7	105.6	1.2	1.0		174	Med dense, Sand to silty sand	40-42	40-60				31 - 34	30 - 33
27.5	122.0	119.3	1.1	0.9		179	Med dense, Sand to silty sand	40-42	40-60				34 - 41	33 - 40
28.0	124.4	121.2	1.2	0.9		171	Med dense, Sand to silty sand	40-42	40-60				34 - 41	33 - 40
28.5	131.3	127.7	1.1	0.8		167	Med dense, Sand to silty sand	40-42	40-60				34 - 41	33 - 40
29.0	134.1	130.0	1.3	0.9		163	Med dense, Sand to silty sand	40-42	40-60				34 - 41	33 - 40
29.5	137.1	132.6	1.4	1.0		157	Med dense, Sand to silty sand	40-42	40-60				41 - 48	40 - 46
30.0	144.7	139.5	1.2	0.8		157	Med dense, Sand to silty sand	40-42	40-60				41 - 48	40 - 46
30.5	151.1	145.3	1.5	1.0		157	Dense, Sand to silty sand	40-42	60-80				42 - 48	40 - 46
31.0	152.2	145.9	1.6	1.0		157	Dense, Sand to silty sand	40-42	60-80				42 - 48	40 - 46
31.5	156.4	149.6	1.8	1.1		168	Dense, Sand to silty sand	40-42	60-80				48 - 63	46 - 60
32.0	163.0	155.4	1.9	1.1		168	Dense, Sand to silty sand	40-42	60-80				48 - 63	46 - 60
32.5	178.8	170.1	2.1	1.2		186	Dense, Sand to silty sand	40-42	60-80				48 - 63	46 - 60
33.0	171.3	162.5	2.1	1.2		190	Dense, Sand to silty sand	40-42	60-80				48 - 63	46 - 60
33.5	179.5	169.8	1.8	1.0		201	Dense, Sand to silty sand	42-46	60-80				49 - 63	46 - 60
34.0	174.7	164.9	2.1	1.2		191	Dense, Sand to silty sand	40-42	60-80				49 - 64	46 - 60
34.5	152.4	143.4	1.8	1.1		190	Dense, Sand to silty sand	40-42	60-80				42 - 49	40 - 46
35.0	141.2	132.6	1.6	1.1		190	Med dense, Sand to silty sand	40-42	40-60				43 - 49	40 - 46
35.5	132.5	124.1	1.3	0.9		201	Med dense, Sand to silty sand	40-42	40-60				35 - 43	33 - 40
36.0	127.9	119.5	1.1	0.9		206	Med dense, Sand to silty sand	40-42	40-60				35 - 43	33 - 40
36.5	107.3	100.0	0.8	0.7		206	Med dense, Sand to silty sand	40-42	40-60				25 - 32	23 - 30
37.0	69.4	64.5	0.6	0.8		218	Med dense, Sand to silty sand	37-40	40-60				16 - 18	15 - 17
37.5	68.0	63.0	0.8	0.8		259	Med dense, Sand to silty sand	37-40	40-60				16 - 18	15 - 17
38.0	117.2	108.4	0.9	0.7		272	Med dense, Sand to silty sand	40-42	40-60				32 - 36	30 - 33
38.5	134.1	123.7	1.1	0.7		234	Med dense, Sand to silty sand	40-42	40-60				36 - 43	33 - 40
39.0	158.7	146.2	1.3	0.8		223	Med dense, Sand to silty sand	40-42	40-60				43 - 50	40 - 46
39.5	161.2	148.1	1.5	0.9		214	Med dense, Sand to silty sand	40-42	40-60				44 - 50	40 - 46
40.0	170.3	156.1	1.4	0.8		214	Med dense, Sand to silty sand	42-46	40-60				44 - 50	40 - 46
40.5	172.2	157.4	1.8	1.0		200	Dense, Sand to silty sand	40-42	60-80				50 - 66	46 - 60

STRATIGRAPHICS

JOB NO: '96-110-220
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp009

PAGE 3

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	FRICTION (TSF)	AVERAGED RATIO (%)	GENERATED PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (Nf)
41.0	176.7	161.2	1.8	1.0		192	Dense, Sand to silty sand	40-42	60-80				50 - 66	46 - 60
41.5	163.5	148.8	1.8	1.0		201	Dense, Sand to silty sand	40-42	60-80				51 - 66	46 - 60
42.0	127.9	116.1	1.7	1.1		201	Med dense, Sand to silty sand	40-42	40-60				36 - 44	33 - 40
42.5	158.0	143.1	1.8	1.1		251	Dense, Sand to silty sand	40-42	60-80				51 - 66	46 - 60
43.0	149.7	135.3	1.6	1.1		217	Med dense, Sand to silty sand	40-42	40-60				44 - 51	40 - 46
43.5	85.3	76.9	1.3	1.1		223	Med dense, Sand to silty sand	37-40	40-60				22 - 26	20 - 23
44.0	68.8	61.9	0.9	1.2		277	Med dense, Silty sand to sandy silt	37-40	40-60				19 - 22	17 - 20
44.5	49.8	44.7	1.1	1.6		266	Med dense, Silty sand to sandy silt	36-37	40-60				13 - 17	12 - 15
45.0	43.3	38.8	0.6	0.8		470	Loose, Silty sand to sandy silt	36-37	20-40				8 - 11	7 - 10
45.5	118.3	105.8	1.0	0.8		278	Med dense, Sand to silty sand	40-42	40-60				26 - 34	23 - 30
46.0	116.0	103.5	1.1	0.9		235	Med dense, Sand to silty sand	40-42	40-60				34 - 37	30 - 33
46.5	119.5	106.3	1.0	0.9		243	Med dense, Sand to silty sand	40-42	40-60				34 - 37	30 - 33
47.0	117.3	104.2	1.1	0.9		254	Med dense, Sand to silty sand	40-42	40-60				34 - 37	30 - 33
47.5	98.9	87.6	1.0	0.9		256	Med dense, Sand to silty sand	40-42	40-60				26 - 34	23 - 30
48.0	81.2	71.8	1.0	1.1		283	Med dense, Sand to silty sand	37-40	40-60				23 - 26	20 - 23
48.5	41.5	36.6	1.2	1.7		278	Med dense, Silty sand to sandy silt	27-31	40-60				11 - 14	10 - 12
49.0	57.7	50.8	0.5	1.1		335	Med dense, Silty sand to sandy silt	37-40	40-60				14 - 17	12 - 15
49.5	25.4	22.3	0.7	1.6		324	Loose, Silty sand to sandy silt	27-31	20-40				5 - 7	4 - 6
50.0	36.8	32.3	0.5	1.0		670	Loose, Silty sand to sandy silt	36-37	20-40				7 - 8	6 - 7
50.5	51.4	45.0	0.6	1.0		580	Loose, Silty sand to sandy silt	36-37	20-40				8 - 11	7 - 10
51.0	54.8	47.8	0.4	0.7		400	Loose, Sand to silty sand	37-40	20-40				8 - 11	7 - 10
51.5	78.1	68.1	0.5	0.5		343	Loose, Sand to silty sand	40-42	20-40				14 - 17	12 - 15
52.0	135.6	118.0	1.1	0.9		315	Med dense, Sand to silty sand	40-42	40-60				38 - 46	33 - 40
52.5	89.1	77.4	1.2	1.1		335	Med dense, Sand to silty sand	37-40	40-60				23 - 26	20 - 23
53.0	26.0	22.6	0.8	1.9		785	V stiff, Sandy silt to sandy clay			20	2.29	1.68	7 - 8	6 - 7
53.5	34.9	30.2	0.5	1.5		1196	Loose, Silty sand to sandy silt	27-31	20-40				8 - 12	7 - 10
54.0	37.4	32.3	0.5	1.2		1503	Loose, Silty sand to sandy silt	36-37	20-40				7 - 8	6 - 7
54.5	41.8	36.1	0.5	1.1		1814	Loose, Silty sand to sandy silt	36-37	20-40				8 - 12	7 - 10
55.0	41.7	35.8	0.4	0.8		2221	Loose, Silty sand to sandy silt	36-37	20-40				7 - 8	6 - 7
55.5	39.3	33.7	0.4	1.0		2567	Loose, Silty sand to sandy silt	36-37	20-40				7 - 8	6 - 7
56.0	40.5	34.7	0.3	0.8		3501	Loose, Silty sand to sandy silt	36-37	20-40				7 - 8	6 - 7
56.5	42.2	36.1	0.6	1.6		3574	Med dense, Silty sand to sandy silt	27-31	40-60				12 - 14	10 - 12
57.0	35.9	30.7	0.4	1.1		4194	Loose, Silty sand to sandy silt	36-37	20-40				7 - 8	6 - 7
57.5	31.7	27.0	0.4	1.1		4790	Loose, Silty sand to sandy silt	31-36	20-40				5 - 7	4 - 6
58.0	27.2	23.1	0.3	1.1		5128	Loose, Silty sand to sandy silt	27-31	20-40				5 - 7	4 - 6
58.5	25.6	21.7	0.3	1.2		5317	Loose, Silty sand to sandy silt	27-31	20-40				5 - 7	4 - 6
59.0	25.9	21.9	0.3	1.3		5382	Loose, Silty sand to sandy silt	27-31	20-40				5 - 7	4 - 6

NOTES: * Indicates lightly overconsolidated soil
 ** Indicates heavily overconsolidated or cemented soil

Mixed soils containing both granular and fine grained particles (e.g. clayey sands) may undergo partial drained failure during CPT. Both undrained and drained parameters can be estimated for these soils.

Structure rate of loading should be considered in choosing which strength parameters to use for design. Drained and undrained parameters must not be combined as such combination will result in significant overprediction of in situ shear strength.

STRATIGRAPHICS

JOB NO: '96-110-220
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp010

PAGE 1

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED FRICTION (TSF)	GENERATED PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (Nf)
1.0	99.5	160.2	1.5	1.6	303	Dense, Sand to silty sand	40-42	60-80				37 - 45	60 - 72
1.5	81.6	124.3	1.2	1.3	247	Dense, Sand to silty sand	40-42	60-80				26 - 30	40 - 46
2.0	59.6	87.1	0.8	1.2	222	Med dense, Sand to silty sand	37-40	40-60				16 - 21	23 - 30
2.5	18.3	25.9	0.7	1.9	244	Med dense, Silty sand to sandy silt	27-31	40-60				4 - 5	6 - 7
3.0	15.5	21.3	0.4	2.6	323	Stiff, Sandy clay to silty clay *			20	1.53	0.85	4 - 5	6 - 7
3.5	17.2	23.1	0.7	4.2	330	Stiff, Silty clay to clay *			20	1.70	1.43	9 - 11	12 - 15
4.0	17.5	23.0	0.9	4.8	324	Stiff, Silty clay to clay *			20	1.73	1.79	11 - 13	15 - 17
4.5	20.7	26.6	1.0	4.8	353	V stiff, Silty clay to clay *			20	2.04	2.05	16 - 18	20 - 23
5.0	19.6	24.7	0.9	4.0	344	Stiff, Silty clay to clay *			20	1.93	1.75	12 - 13	15 - 17
5.5	23.9	29.6	1.1	3.9	306	V stiff, Silty clay to clay *			20	2.35	2.14	14 - 16	17 - 20
6.0	35.8	43.8	1.1	2.2	264	Med dense, Silty sand to sandy silt	27-31	40-60				12 - 14	15 - 17
6.5	72.1	86.8	1.0	1.3	165	Med dense, Silty sand to sandy silt	37-40	40-60				19 - 25	23 - 30
7.0	63.9	75.9	0.4	0.5	197	Loose, Sand to silty sand	40-42	20-40				13 - 14	15 - 17
7.5	56.0	65.8	0.5	0.7	269	Loose, Sand to silty sand	37-40	20-40				10 - 13	12 - 15
8.0	72.5	84.1	0.6	0.6	453	Med dense, Sand to silty sand	40-42	40-60				15 - 17	17 - 20
8.5	104.2	119.4	0.7	0.7	324	Med dense, Sand to silty sand	40-42	40-60				26 - 29	30 - 33
9.0	103.8	117.6	1.1	1.0	291	Med dense, Sand to silty sand	40-42	40-60				29 - 35	33 - 40
9.5	118.0	132.4	1.3	1.1	353	Med dense, Sand to silty sand	40-42	40-60				36 - 41	40 - 46
10.0	127.6	141.7	1.3	1.0	355	Med dense, Sand to silty sand	40-42	40-60				36 - 41	40 - 46
10.5	119.6	132.3	1.2	1.0	325	Med dense, Sand to silty sand	40-42	40-60				36 - 42	40 - 46
11.0	37.8	41.6	1.4	1.8	330	Med dense, Silty sand to sandy silt	27-31	40-60				11 - 14	12 - 15
11.5	14.4	15.8	0.5	2.2	1020	Stiff, Sandy silt to clayey silt			15	1.83	0.92	4 - 5	4 - 6
12.0	18.8	20.5	0.3	1.8	503	V stiff, Sandy silt to clayey silt			15	2.41	0.64	4 - 6	4 - 6
12.5	15.7	17.0	0.3	1.6	768	Stiff, Sandy silt to clayey silt			15	1.99	0.57	3 - 4	3 - 4
13.0	12.6	13.7	0.2	1.2	1464	Loose, Silty sand to sandy silt	27-31	20-40				1 - 3	1 - 3
13.5	12.7	13.7	0.3	1.9	1139	Stiff, Sandy silt to clayey silt			15	1.59	0.51	3 - 4	3 - 4
14.0	8.8	9.4	0.1	1.3	1250	Stiff, Sandy silt to clayey silt			10	1.59	0.26	1 - 3	1 - 3
14.5	8.4	8.9	0.1	1.3	1312	Stiff, Sandy silt to clayey silt			10	1.50	0.22	1 - 3	1 - 3
15.0	7.6	8.0	0.1	0.8	1271	Stiff, Sandy silt to clayey silt			10	1.33	0.11	1 - 3	1 - 3
15.5	7.4	7.9	0.1	1.0	1196	Stiff, Sandy silt to clayey silt			10	1.30	0.17	1 - 3	1 - 3
16.0	7.9	8.3	0.0	0.5	975	V loose, Silty sand to sandy silt	27-31	0-20				1 - 3	1 - 3
16.5	8.1	8.5	0.0	0.3	1004	V loose, Silty sand to sandy silt	27-31	0-20				1 - 3	1 - 3
17.0	8.3	8.7	0.1	0.7	1096	Stiff, Sandy silt to clayey silt			10	1.45	0.13	1 - 3	1 - 3
17.5	9.3	9.7	0.0	0.3	980	V loose, Silty sand to sandy silt	27-31	0-20				1 - 3	1 - 3
18.0	18.3	19.0	0.5	2.8	670	V stiff, Sandy clay to silty clay *			15	2.30	1.02	6 - 7	6 - 7
18.5	9.7	10.0	0.1	1.0	752	Stiff, Sandy silt to clayey silt			10	1.71	0.26	1 - 3	1 - 3
19.0	8.0	8.3	0.0	0.5	1001	V loose, Silty sand to sandy silt	27-31	0-20				1 - 3	1 - 3
19.5	8.4	8.6	0.0	0.4	982	V loose, Silty sand to sandy silt	27-31	0-20				1 - 3	1 - 3
20.0	13.9	14.3	0.1	0.3	803	V loose, Silty sand to sandy silt	31-36	0-20				1 - 3	1 - 3
20.5	27.5	28.1	0.9	2.6	491	V stiff, Sandy silt to sandy clay			20	2.62	1.74	10 - 12	10 - 12

STRATIGRAPHICS

PAGE 2

JOB NO: '96-110-220
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp010

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED FRICTION		GENERATED PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)		UNDRAINED STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (Nf)
			FRICTION (TSF)	RATIO (%)											
21.0	14.2	14.4	0.2	1.2		703	Loose, Silty sand to sandy silt	27-31	20-40					1 - 3	1 - 3
21.5	11.9	12.1	0.1	0.8		696	V loose, Silty sand to sandy silt	27-31	0-20					1 - 3	1 - 3
22.0	14.5	14.7	0.2	1.6		870	Stiff, Sandy silt to clayey silt			15	1.76	0.48		3 - 4	3 - 4
22.5	11.3	11.4	0.3	1.8		972	Stiff, Sandy silt to clayey silt			15	1.33	0.55		1 - 3	1 - 3
23.0	10.4	10.5	0.1	1.1		1003	Stiff, Sandy silt to clayey silt			15	1.20	0.24		1 - 3	1 - 3
23.5	10.1	10.2	0.1	0.7		1046	V loose, Silty sand to sandy silt	27-31	0-20					1 - 3	1 - 3
24.0	26.6	26.6	0.3	1.7		849	Loose, Silty sand to sandy silt	27-31	20-40					6 - 7	6 - 7
24.5	10.4	10.4	0.2	1.3		763	Stiff, Sandy silt to clayey silt			15	1.20	0.46		1 - 3	1 - 3
25.0	9.7	9.6	0.1	0.7		892	V loose, Silty sand to sandy silt	27-31	0-20					1 - 3	1 - 3
25.5	9.5	9.4	0.1	0.8		968	V loose, Silty sand to sandy silt	27-31	0-20					1 - 3	1 - 3
26.0	9.7	9.6	0.1	0.9		1026	Stiff, Sandy silt to clayey silt			10	1.63	0.17		1 - 3	1 - 3
26.5	9.6	9.5	0.1	0.9		1088	Stiff, Sandy silt to clayey silt			10	1.61	0.17		1 - 3	1 - 3
27.0	10.8	10.6	0.2	1.4		973	Stiff, Sandy silt to clayey silt			15	1.23	0.31		1 - 3	1 - 3
27.5	10.5	10.3	0.1	1.4		1275	Stiff, Sandy silt to clayey silt			15	1.18	0.30		1 - 3	1 - 3
28.0	10.4	10.1	0.1	1.0		1077	Stiff, Sandy silt to clayey silt			10	1.74	0.24		1 - 3	1 - 3
28.5	14.7	14.3	0.2	1.7		1230	Stiff, Sandy silt to clayey silt			15	1.73	0.45		3 - 4	3 - 4
29.0	12.7	12.3	0.3	1.9		1049	Stiff, Sandy silt to clayey silt			15	1.46	0.54		1 - 3	1 - 3
29.5	11.9	11.5	0.3	2.1		955	Stiff, Clayey silt to silty clay			15	1.34	0.63		1 - 3	1 - 3
30.0	12.3	11.8	0.3	1.9		1049	Stiff, Sandy silt to clayey silt			15	1.40	0.54		1 - 3	1 - 3
30.5	12.3	11.8	0.3	2.0		640	Stiff, Clayey silt to silty clay			15	1.39	0.58		1 - 3	1 - 3
31.0	10.5	10.1	0.2	1.5		911	Stiff, Sandy silt to clayey silt			10	1.73	0.34		1 - 3	1 - 3
31.5	10.3	9.8	0.2	1.5		1165	Stiff, Sandy silt to clayey silt			10	1.68	0.30		1 - 3	1 - 3
32.0	10.4	9.9	0.2	1.1		1109	Stiff, Sandy silt to clayey silt			10	1.70	0.34		1 - 3	1 - 3
32.5	25.8	24.5	0.5	1.6		678	Loose, Silty sand to sandy silt	27-31	20-40					6 - 7	6 - 7
33.0	51.8	49.1	0.7	1.4		723	Med dense, Silty sand to sandy silt	36-37	40-60					13 - 16	12 - 15
33.5	37.7	35.7	1.0	2.0		566	Med dense, Silty sand to sandy silt	27-31	40-60					11 - 13	10 - 12
34.0	13.5	12.8	0.2	0.9		828	V loose, Silty sand to sandy silt	27-31	0-20					1 - 3	1 - 3
34.5	14.6	13.7	0.2	1.3		1271	Stiff, Sandy silt to clayey silt			15	1.67	0.39		1 - 3	1 - 3
35.0	15.3	14.4	0.3	1.7		1246	Stiff, Sandy silt to clayey silt			15	1.76	0.52		3 - 4	3 - 4
35.5	15.4	14.4	0.3	1.9		1289	Stiff, Sandy silt to clayey silt			15	1.77	0.58		3 - 4	3 - 4
36.0	14.8	13.8	0.2	1.6		1287	Stiff, Sandy silt to clayey silt			15	1.68	0.50		1 - 3	1 - 3
36.5	14.0	13.0	0.2	1.6		1401	Stiff, Sandy silt to clayey silt			15	1.57	0.47		1 - 3	1 - 3
37.0	15.6	14.5	0.3	1.7		1349	Stiff, Sandy silt to clayey silt			15	1.78	0.51		3 - 4	3 - 4
37.5	15.4	14.2	0.3	1.6		1385	Stiff, Sandy silt to clayey silt			15	1.75	0.50		1 - 3	1 - 3
38.0	14.9	13.8	0.2	1.6		1340	Stiff, Sandy silt to clayey silt			15	1.69	0.49		1 - 3	1 - 3
38.5	15.0	13.8	0.3	1.6		1385	Stiff, Sandy silt to clayey silt			15	1.69	0.50		1 - 3	1 - 3
39.0	16.3	15.0	0.2	1.6		1326	Stiff, Sandy silt to clayey silt			15	1.86	0.49		3 - 4	3 - 4
39.5	15.1	13.9	0.2	1.6		1313	Stiff, Sandy silt to clayey silt			15	1.70	0.49		1 - 3	1 - 3
40.0	15.2	13.9	0.2	1.6		1293	Stiff, Sandy silt to clayey silt			15	1.71	0.48		1 - 3	1 - 3
40.5	15.1	13.8	0.3	1.6		1298	Stiff, Sandy silt to clayey silt			15	1.69	0.50		1 - 3	1 - 3

STRATIGRAPHICS

JOB NO: '96-110-220
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp010

PAGE 3

JOB NAME:		Zone A Charleston Naval Base, S.C.										UNDRAINED LARGE STRAIN			
SOUNDING NO:		cp010		AVERAGED		GENERATED				DRAINED		UNDRAINED			
		NORM		FRICTION		PORE WATER		SOIL		FRICTION		SHEAR		SHEAR	
		CONE		RATIO		PRESSURE		CONDUCTIVITY		ANGLE		STRENGTH		STRENGTH	
DEPTH	CONE	CONE	FRICION	RATIO	PRESSURE	CONDUCTIVITY	SOIL TYPE	ANGLE	DENSITY	Nc	STRENGTH	STRENGTH	SPT	NORM	
(FT)	(TSF)	(TSF)	(TSF)	(%)	(TSF)	(uS/cm)		(DEG)	(%)		(KSF)	(KSF)	(N)	(Nf)	
41.0	15.7	14.3	0.2	1.5		1349	Stiff, Sandy silt to clayey silt			15	1.77	0.49	1 - 3	1 - 3	
41.5	16.0	14.5	0.3	1.6		1354	Stiff, Sandy silt to clayey silt			15	1.80	0.52	3 - 4	3 - 4	
42.0	16.0	14.5	0.3	1.6		1348	Stiff, Sandy silt to clayey silt			15	1.79	0.50	1 - 3	1 - 3	
42.5	15.6	14.2	0.3	1.6		1264	Stiff, Sandy silt to clayey silt			15	1.74	0.50	1 - 3	1 - 3	
43.0	15.2	13.8	0.2	1.5		1309	Stiff, Sandy silt to clayey silt			15	1.69	0.48	1 - 3	1 - 3	
43.5	14.9	13.4	0.2	1.6		1294	Stiff, Sandy silt to clayey silt			15	1.64	0.49	1 - 3	1 - 3	
44.0	16.0	14.4	0.3	1.7		1284	Stiff, Sandy silt to clayey silt			15	1.78	0.53	3 - 4	3 - 4	
44.5	14.7	13.2	0.2	1.6		1150	Stiff, Sandy silt to clayey silt			15	1.60	0.47	1 - 3	1 - 3	
45.0	15.1	13.5	0.3	1.2		1251	Loose, Silty sand to sandy silt	27-31	20-40				1 - 3	1 - 3	
45.5	62.7	56.0	1.5	1.1		722	Med dense, Silty sand to sandy silt	37-40	40-60				13 - 17	12 - 15	
46.0	169.9	151.5	2.2	1.4		387	Dense, Sand to silty sand	40-42	60-80				52 - 67	46 - 60	
46.5	90.9	80.9	2.1	1.5		368	Med dense, Silty sand to sandy silt	37-40	40-60				26 - 34	23 - 30	
47.0	45.4	40.3	1.8	2.1		548	Med dense, Silty sand to sandy silt	27-31	40-60				14 - 17	12 - 15	
47.5	57.1	50.6	2.0	2.3		518	Dense, Silty sand to sandy silt	27-31	60-80				23 - 26	20 - 23	
48.0	16.5	14.6	0.3	1.0		935	Loose, Silty sand to sandy silt	27-31	20-40				1 - 3	1 - 3	
48.5	15.2	13.5	0.1	0.6		1358	V loose, Silty sand to sandy silt	31-36	0-20				1 - 3	1 - 3	
49.0	15.1	13.3	0.1	0.7		1475	V loose, Silty sand to sandy silt	27-31	0-20				1 - 3	1 - 3	
49.5	16.5	14.5	0.4	2.2		1107	Stiff, Sandy silt to clayey silt			15	1.81	0.79	3 - 5	3 - 4	
50.0	13.3	11.6	0.2	1.2		1302	Stiff, Sandy silt to clayey silt			15	1.37	0.37	1 - 3	1 - 3	
50.5	17.0	14.9	0.3	1.6		1339	Stiff, Sandy silt to clayey silt			15	1.86	0.50	3 - 5	3 - 4	
51.0	15.6	13.7	0.3	0.6		1526	V loose, Silty sand to sandy silt	31-36	0-20				1 - 3	1 - 3	
51.5	80.4	70.1	0.8	0.7		920	Med dense, Sand to silty sand	37-40	40-60				17 - 19	15 - 17	
52.0	116.5	101.4	0.7	0.6		1126	Med dense, Sand to silty sand	40-42	40-60				26 - 34	23 - 30	
52.5	111.6	96.9	0.7	0.6		1159	Med dense, Sand to silty sand	40-42	40-60				26 - 35	23 - 30	
53.0	109.9	95.2	0.4	0.3		1412	Med dense, Sand to silty sand	40-42	40-60				20 - 23	17 - 20	
53.5	96.9	83.8	0.4	0.4		1329	Loose, Sand to silty sand	40-42	20-40				20 - 23	17 - 20	
54.0	21.3	18.4	0.6	1.1		1495	Loose, Silty sand to sandy silt	27-31	20-40				3 - 5	3 - 4	
54.5	44.1	38.0	0.6	1.4		1406	Med dense, Silty sand to sandy silt	36-37	40-60				8 - 12	7 - 10	
55.0	54.9	47.2	0.6	1.0		1216	Loose, Silty sand to sandy silt	36-37	20-40				12 - 14	10 - 12	
55.5	50.1	43.0	0.3	0.6		1292	Loose, Sand to silty sand	37-40	20-40				8 - 12	7 - 10	
56.0	44.6	38.2	0.4	0.8		1273	Loose, Silty sand to sandy silt	36-37	20-40				8 - 12	7 - 10	
56.5	46.8	40.0	0.4	0.8		1019	Loose, Silty sand to sandy silt	36-37	20-40				8 - 12	7 - 10	
57.0	43.5	37.1	0.3	0.7		219	Loose, Silty sand to sandy silt	36-37	20-40				7 - 8	6 - 7	
57.5	35.7	30.4	0.2	0.6		1396	Loose, Silty sand to sandy silt	36-37	20-40				5 - 7	4 - 6	
58.0	32.5	27.7	0.3	0.9		1375	Loose, Silty sand to sandy silt	31-36	20-40				5 - 7	4 - 6	
58.5	35.3	29.9	0.3	0.9		1343	Loose, Silty sand to sandy silt	36-37	20-40				7 - 8	6 - 7	
59.0	31.8	26.9	0.3	0.9		1362	Loose, Silty sand to sandy silt	31-36	20-40				5 - 7	4 - 6	
59.5	18.4	15.6	0.0	1.0		1258	Loose, Silty sand to sandy silt	27-31	20-40				1 - 4	1 - 3	

NOTES: * Indicates lightly overconsolidated soil
 ** Indicates heavily overconsolidated or cemented soil

Mixed soils containing both granular and fine grained particles (e.g. clayey sands) may undergo partial drained failure during CPT. Both undrained and drained parameters can be estimated for these soils.

Structure rate of loading should be considered in choosing which strength parameters to use for design. Drained and undrained parameters must not be combined as such combination will result in significant overprediction of in situ shear strength.

STRATIGRAPHICS

PAGE 1

JOB NO: '96-110-220
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp011

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED		GENERATED PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)		SPT (N)	NORM SPT (Nf)
			FRICTION (TSF)	RATIO (%)							UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)		
1.0	256.5	413.2	3.9	1.2		2315	V dense, Sand to silty sand	42-46	80-100				+ 62	+ 100
1.5	118.7	180.8	2.7	1.7		800	Dense, Sand to silty sand	40-42	60-80				39 - 47	60 - 72
2.0	105.2	153.6	2.1	1.6		323	Dense, Sand to silty sand	40-42	60-80				41 - 49	60 - 72
2.5	35.9	50.7	1.4	2.5		448	V stiff, Sandy silt to sandy clay			25	2.86	2.87	14 - 16	20 - 23
3.0	39.6	54.3	1.4	2.6		358	V stiff, Sandy silt to sandy clay			25	3.15	2.84	17 - 22	23 - 30
3.5	51.9	69.5	0.6	1.2		278	Med dense, Silty sand to sandy silt	37-40	40-60				15 - 17	20 - 23
4.0	21.3	27.9	0.5	1.5		374	Loose, Silty sand to sandy silt	27-31	20-40				5 - 5	6 - 7
4.5	20.5	26.4	0.2	0.9		502	Loose, Silty sand to sandy silt	31-36	20-40				3 - 5	4 - 6
5.0	14.8	18.7	0.2	1.0		385	Loose, Silty sand to sandy silt	27-31	20-40				2 - 3	3 - 4
5.5	19.8	24.6	0.1	0.6		395	Loose, Silty sand to sandy silt	31-36	20-40				2 - 3	3 - 4
6.0	19.0	23.2	0.2	0.9		325	Loose, Silty sand to sandy silt	31-36	20-40				3 - 5	4 - 6
6.5	18.4	22.2	0.2	0.9		249	Loose, Silty sand to sandy silt	31-36	20-40				2 - 3	3 - 4
7.0	11.4	13.5	0.2	1.5		337	Stiff, Sandy silt to clayey silt			15	1.46	0.46	1 - 3	1 - 3
7.5	3.8	4.5	0.1	1.5		722	Soft, Clayey silt to silty clay			18	0.38	0.21	1 - 3	1 - 3
8.0	8.2	9.6	0.1	0.6		790	V loose, Silty sand to sandy silt	27-31	0-20				1 - 3	1 - 3
8.5	5.9	6.7	0.3	2.3		624	Stiff, Clayey silt to silty clay			10	1.07	0.51	1 - 3	1 - 3
9.0	5.4	6.2	0.0	0.6		1420	Firm, Sensitive fine grained soil			18	0.54	0.07	1 - 3	1 - 3
9.5	3.3	3.7	0.0	0.5		1000	Soft, Sensitive fine grained soil			18	0.30	0.06	0 - 1	0 - 1
10.0	2.1	2.4	0.0	0.4		1214	V soft, Sensitive fine grained soil			25	0.12	0.05	0 - 1	0 - 1
10.5	16.1	17.8	0.1	0.7		1165	V loose, Silty sand to sandy silt	31-36	0-20				1 - 3	1 - 3
11.0	6.9	7.6	0.2	1.1		1387	Stiff, Sandy silt to clayey silt			10	1.25	0.34	1 - 3	1 - 3
11.5	2.5	2.7	0.1	2.2		2281	V soft, Sensitive fine grained soil			18	0.20	0.17	0 - 1	0 - 1
12.0	5.5	6.0	0.1	1.5		2248	Firm, Clayey silt to silty clay			10	0.96	0.20	1 - 3	1 - 3
12.5	7.2	7.9	0.2	2.0		2310	Stiff, Clayey silt to silty clay			10	1.30	0.50	1 - 3	1 - 3
13.0	25.9	28.0	0.3	0.7		1968	Loose, Silty sand to sandy silt	36-37	20-40				4 - 6	4 - 6
13.5	35.4	38.1	0.1	0.2		1932	Loose, Sand to silty sand	37-40	20-40				6 - 6	6 - 7
14.0	53.2	57.0	0.1	0.3		1602	Loose, Sand to silty sand	40-42	20-40				7 - 9	7 - 10
14.5	74.3	79.4	0.1	0.1		1772	Loose, Sand to silty sand	40-42	20-40				11 - 14	12 - 15
15.0	69.3	73.7	0.4	0.5		1772	Loose, Sand to silty sand	40-42	20-40				14 - 16	15 - 17
15.5	50.4	53.5	0.1	0.2		1665	Loose, Sand to silty sand	37-40	20-40				7 - 9	7 - 10
16.0	73.5	77.6	0.1	0.2		1688	Loose, Sand to silty sand	40-42	20-40				11 - 14	12 - 15
16.5	69.7	73.3	0.2	0.2		1473	Loose, Sand to silty sand	40-42	20-40				11 - 14	12 - 15
17.0	44.3	46.4	0.5	0.9		1313	Loose, Silty sand to sandy silt	37-40	20-40				7 - 10	7 - 10
17.5	42.5	44.4	0.1	0.3		1110	Loose, Sand to silty sand	37-40	20-40				6 - 7	6 - 7
18.0	68.7	71.5	0.2	0.3		916	Loose, Sand to silty sand	40-42	20-40				12 - 14	12 - 15
18.5	26.2	27.1	1.0	1.8		791	Med dense, Silty sand to sandy silt	27-31	40-60				6 - 7	6 - 7
19.0	13.6	14.0	0.5	1.9		1079	Stiff, Sandy silt to clayey silt			15	1.65	0.97	3 - 4	3 - 4
19.5	42.8	44.0	0.6	1.9		1310	Med dense, Silty sand to sandy silt	27-31	40-60				15 - 17	15 - 17
20.0	15.5	15.9	0.6	2.2		1371	Stiff, Sandy silt to clayey silt			15	1.90	1.24	4 - 6	4 - 6
20.5	45.6	46.6	0.4	0.9		1475	Loose, Silty sand to sandy silt	37-40	20-40				7 - 10	7 - 10

STRATIGRAPHICS

PAGE 2

JOB NO: '96-110-220
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp011

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED		GENERATED PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED LARGE STRAIN		SPT (N)	NORM SPT (Nf)
			FRICTION (TSF)	RATIO (%)							SHEAR STRENGTH (KSF)	SHEAR STRENGTH (KSF)		
21.0	45.6	46.4	0.9	1.8		1355	Med dense, Silty sand to sandy silt	36-37	40-60				15 - 17	15 - 17
21.5	68.8	69.8	0.8	1.3		1531	Med dense, Silty sand to sandy silt	37-40	40-60				20 - 23	20 - 23
22.0	48.1	48.6	0.8	1.4		1282	Med dense, Silty sand to sandy silt	36-37	40-60				12 - 15	12 - 15
22.5	25.4	25.6	0.9	2.6		1377	V stiff, Sandy silt to sandy clay			20	2.40	1.79	7 - 10	7 - 10
23.0	44.2	44.4	0.5	1.3		1124	Med dense, Silty sand to sandy silt	36-37	40-60				10 - 12	10 - 12
23.5	32.7	32.7	0.7	1.4		960	Loose, Silty sand to sandy silt	27-31	20-40				7 - 10	7 - 10
24.0	52.4	52.3	0.8	1.1		689	Med dense, Silty sand to sandy silt	36-37	40-60				12 - 15	12 - 15
24.5	84.3	83.9	0.9	0.9		498	Med dense, Sand to silty sand	40-42	40-60				20 - 23	20 - 23
25.0	102.6	101.8	1.0	0.9		381	Med dense, Sand to silty sand	40-42	40-60				30 - 33	30 - 33
25.5	117.0	115.8	1.1	1.0		347	Med dense, Sand to silty sand	40-42	40-60				33 - 40	33 - 40
26.0	120.4	118.8	1.2	1.0		338	Med dense, Sand to silty sand	40-42	40-60				33 - 41	33 - 40
26.5	121.6	119.6	1.3	1.1		343	Med dense, Sand to silty sand	40-42	40-60				34 - 41	33 - 40
27.0	112.3	110.1	1.2	1.0		354	Med dense, Sand to silty sand	40-42	40-60				31 - 34	30 - 33
27.5	88.0	86.1	1.1	1.1		377	Med dense, Sand to silty sand	37-40	40-60				24 - 31	23 - 30
28.0	112.7	109.9	1.1	0.9		395	Med dense, Sand to silty sand	40-42	40-60				31 - 34	30 - 33
28.5	125.9	122.4	1.2	1.0		392	Med dense, Sand to silty sand	40-42	40-60				34 - 41	33 - 40
29.0	130.6	126.6	1.4	1.1		412	Med dense, Sand to silty sand	40-42	40-60				41 - 47	40 - 46
29.5	113.3	109.5	1.3	1.1		410	Med dense, Sand to silty sand	40-42	40-60				34 - 41	33 - 40
30.0	119.0	114.7	1.0	0.9		437	Med dense, Sand to silty sand	40-42	40-60				31 - 34	30 - 33
30.5	84.3	81.1	1.5	1.4		447	Med dense, Silty sand to sandy silt	37-40	40-60				24 - 31	23 - 30
31.0	114.3	109.6	1.3	1.2		583	Med dense, Sand to silty sand	40-42	40-60				34 - 42	33 - 40
31.5	88.0	84.2	1.1	1.1		468	Med dense, Sand to silty sand	37-40	40-60				24 - 31	23 - 30
32.0	95.0	90.6	0.9	0.8		567	Med dense, Sand to silty sand	40-42	40-60				21 - 24	20 - 23
32.5	136.5	129.9	1.3	0.9		485	Med dense, Sand to silty sand	40-42	40-60				35 - 42	33 - 40
33.0	136.0	129.0	1.4	1.0		458	Med dense, Sand to silty sand	40-42	40-60				42 - 48	40 - 46
33.5	110.2	104.3	1.3	1.0		457	Med dense, Sand to silty sand	40-42	40-60				32 - 35	30 - 33
34.0	122.3	115.4	1.4	1.1		451	Med dense, Sand to silty sand	40-42	40-60				35 - 42	33 - 40
34.5	100.5	94.6	1.2	1.1		434	Med dense, Sand to silty sand	40-42	40-60				24 - 32	23 - 30
35.0	68.0	63.8	1.1	1.3		439	Med dense, Silty sand to sandy silt	37-40	40-60				18 - 21	17 - 20
35.5	75.4	70.6	0.7	0.8		610	Med dense, Sand to silty sand	37-40	40-60				16 - 18	15 - 17
36.0	118.6	110.8	1.2	1.0		388	Med dense, Sand to silty sand	40-42	40-60				32 - 35	30 - 33
36.5	107.0	99.7	1.3	1.1		366	Med dense, Sand to silty sand	40-42	40-60				32 - 35	30 - 33
37.0	90.3	84.0	0.9	0.9		389	Med dense, Sand to silty sand	40-42	40-60				22 - 25	20 - 23
37.5	105.1	97.5	1.0	0.9		392	Med dense, Sand to silty sand	40-42	40-60				25 - 32	23 - 30
38.0	110.5	102.3	0.9	0.8		392	Med dense, Sand to silty sand	40-42	40-60				25 - 32	23 - 30
38.5	122.5	113.1	1.1	0.8		392	Med dense, Sand to silty sand	40-42	40-60				33 - 36	30 - 33
39.0	133.2	122.7	1.3	0.9		392	Med dense, Sand to silty sand	40-42	40-60				36 - 43	33 - 40
39.5	149.3	137.1	1.5	1.0		402	Med dense, Sand to silty sand	40-42	40-60				44 - 50	40 - 46
40.0	159.8	146.4	1.5	0.9		392	Med dense, Sand to silty sand	40-42	40-60				44 - 50	40 - 46
40.5	183.3	167.6	2.0	1.0		387	Dense, Sand to silty sand	42-46	60-80				50 - 66	46 - 60

STRATIGRAPHICS

PAGE 3

JOB NO: '96-110-220
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp011

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED GENERATED			SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (Nf)
			FRICTION (TSF)	RATIO (%)	PORE WATER PRESSURE (TSF)									
41.0	183.9	167.8	2.3	1.2		388	Dense, Sand to silty sand	40-42	60-80				50 - 66	46 - 60
41.5	127.2	115.8	1.7	1.1		404	Med dense, Sand to silty sand	40-42	40-60				36 - 44	33 - 40
42.0	109.2	99.1	1.2	1.0		472	Med dense, Sand to silty sand	40-42	40-60				33 - 36	30 - 33
42.5	96.1	87.1	1.0	0.9		486	Med dense, Sand to silty sand	40-42	40-60				25 - 33	23 - 30
43.0	73.8	66.7	0.7	0.8		491	Med dense, Sand to silty sand	37-40	40-60				17 - 19	15 - 17
43.5	77.7	70.1	0.7	0.9		531	Med dense, Sand to silty sand	37-40	40-60				19 - 22	17 - 20
44.0	92.4	83.1	0.8	0.8		569	Med dense, Sand to silty sand	40-42	40-60				22 - 26	20 - 23
44.5	104.4	93.8	1.1	1.1		558	Med dense, Sand to silty sand	40-42	40-60				26 - 33	23 - 30
45.0	99.9	89.5	1.2	1.2		568	Med dense, Sand to silty sand	37-40	40-60				26 - 33	23 - 30
45.5	105.0	93.8	1.0	0.7		514	Med dense, Sand to silty sand	40-42	40-60				26 - 34	23 - 30
46.0	212.1	189.2	4.3	1.3		493	Dense, Sand to silty sand	42-46	60-80				67 - 81	60 - 72
46.5	411.0	365.9	5.9	1.4		490	V dense, Sa gravel to si gr sand	42-46	80-100				+ 112	+ 100
47.0	448.7	398.6	7.6	1.7		591	V dense, Sa gravel to si gr sand	42-46	+100				+ 113	+ 100
47.5	416.4	369.1	6.4	1.5		627	V dense, Sa gravel to si gr sand	42-46	80-100				+ 113	+ 100
48.0	339.7	300.5	3.6	0.9		591	Dense, Sand to silty sand	42-46	60-80				81 - 112	72 - 99
48.5	265.9	234.7	1.4	0.5		616	Dense, Sand to silty sand	42-46	60-80				68 - 82	60 - 72
49.0	194.6	171.4	0.7	0.3		638	Med dense, Sand to silty sand	42-46	40-60				45 - 52	40 - 46
49.5	150.6	132.4	0.5	0.3		716	Med dense, Sand to silty sand	42-46	40-60				34 - 38	30 - 33
50.0	51.9	45.5	1.6	1.6		921	Med dense, Silty sand to sandy silt	36-37	40-60				14 - 17	12 - 15
50.5	16.4	14.4	0.6	2.0		2595	Stiff, Sandy silt to clayey silt			15	1.78	1.11	3 - 5	3 - 4
51.0	14.2	12.4	0.2	1.2		2774	Stiff, Sandy silt to clayey silt			15	1.49	0.35	1 - 3	1 - 3
51.5	13.8	12.0	0.2	1.4		2951	Stiff, Sandy silt to clayey silt			15	1.43	0.42	1 - 3	1 - 3
52.0	17.3	15.0	0.2	1.0		2922	Loose, Silty sand to sandy silt	27-31	20-40				1 - 3	1 - 3
52.5	26.3	22.8	0.5	1.5		5161	Loose, Silty sand to sandy silt	27-31	20-40				5 - 7	4 - 6
53.0	31.3	27.2	0.6	1.9		5290	Med dense, Silty sand to sandy silt	27-31	40-60				8 - 12	7 - 10
53.5	35.1	30.3	0.6	1.7		5615	Med dense, Silty sand to sandy silt	27-31	40-60				8 - 12	7 - 10
54.0	35.3	30.5	0.5	1.6		5837	Loose, Silty sand to sandy silt	27-31	20-40				8 - 12	7 - 10
54.5	34.6	29.8	0.5	1.4		6056	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
55.0	34.7	29.8	0.5	1.5		6103	Loose, Silty sand to sandy silt	27-31	20-40				8 - 12	7 - 10
55.5	33.7	28.9	0.5	1.6		6656	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
56.0	36.5	31.3	0.6	1.4		6451	Loose, Silty sand to sandy silt	27-31	20-40				8 - 12	7 - 10
56.5	46.5	39.8	0.5	1.5		5894	Med dense, Silty sand to sandy silt	36-37	40-60				12 - 14	10 - 12

NOTES: * Indicates lightly overconsolidated soil
 ** Indicates heavily overconsolidated or cemented soil

Mixed soils containing both granular and fine grained particles (e.g. clayey sands) may undergo partial drained failure during CPT. Both undrained and drained parameters can be estimated for these soils.

Structure rate of loading should be considered in choosing which strength parameters to use for design. Drained and undrained parameters must not be combined as such combination will result in significant overprediction of in situ shear strength.

STRATIGRAPHICS

PAGE 1

JOB NO: '96-110-220
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp012

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED		GENERATED Pore Water Pressure (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)		SPT (N)	NORM SPT (Nf)
			FRICTION (TSF)	RATIO (%)							UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)		
1.0	317.5	511.5	5.3	1.7		682	V dense, Sa gravel to si gr sand	42-46	+100				+ 62	+ 100
1.5	293.1	446.4	4.4	1.4		701	V dense, Sa gravel to si gr sand	42-46	80-100				+ 66	+ 100
2.0	269.1	393.0	2.8	1.0		512	V dense, Sand to silty sand	42-46	80-100				+ 68	+ 100
2.5	238.3	336.5	1.9	0.8		445	Dense, Sand to silty sand	42-46	60-80				51 - 70	72 - 99
3.0	200.3	274.9	2.4	1.1		248	Dense, Sand to silty sand	42-46	60-80				52 - 72	72 - 99
3.5	166.6	223.0	1.9	1.0		254	Dense, Sand to silty sand	42-46	60-80				45 - 54	60 - 72
4.0	121.7	159.4	1.4	1.0		239	Dense, Sand to silty sand	40-42	60-80				35 - 46	46 - 60
4.5	75.8	97.3	0.9	0.9		252	Med dense, Sand to silty sand	40-42	40-60				18 - 23	23 - 30
5.0	40.5	51.0	0.6	1.2		324	Med dense, Silty sand to sandy silt	36-37	40-60				10 - 12	12 - 15
5.5	32.7	40.6	0.9	2.6		649	V stiff, Sandy silt to sandy clay			25	2.59	1.84	14 - 16	17 - 20
6.0	36.8	44.9	0.9	1.9		617	Med dense, Silty sand to sandy silt	27-31	40-60				12 - 14	15 - 17
6.5	66.3	79.8	0.2	0.3		468	Loose, Sand to silty sand	40-42	20-40				12 - 14	15 - 17
7.0	74.0	88.0	0.2	0.2		292	Loose, Sand to silty sand	40-42	20-40				13 - 14	15 - 17
7.5	65.4	76.8	0.0	0.1		349	Loose, Sand to silty sand	40-42	20-40				10 - 13	12 - 15
8.0	56.1	65.1	0.0	0.0		330	Loose, Sand to silty sand	40-42	20-40				6 - 9	7 - 10
8.5	61.2	70.2	0.2	0.2		314	Loose, Sand to silty sand	40-42	20-40				10 - 13	12 - 15
9.0	58.4	66.2	0.2	0.3		300	Loose, Sand to silty sand	40-42	20-40				9 - 11	10 - 12
9.5	45.5	51.1	0.1	0.3		305	Loose, Sand to silty sand	37-40	20-40				6 - 9	7 - 10
10.0	32.3	35.9	0.1	0.4		414	Loose, Sand to silty sand	37-40	20-40				5 - 6	6 - 7
10.5	37.0	40.9	0.2	0.4		415	Loose, Sand to silty sand	37-40	20-40				5 - 6	6 - 7
11.0	45.1	49.6	0.3	0.6		356	Loose, Sand to silty sand	37-40	20-40				6 - 9	7 - 10
11.5	22.6	24.7	0.7	1.9		401	V stiff, Sandy silt to sandy clay			20	2.19	1.35	5 - 6	6 - 7
12.0	30.3	33.1	0.7	2.1		410	V stiff, Sandy silt to sandy clay			20	2.96	1.35	9 - 11	10 - 12
12.5	15.1	16.5	0.6	2.8		698	Stiff, Sandy clay to silty clay *			15	1.92	1.12	6 - 6	6 - 7
13.0	12.4	13.5	0.4	2.3		638	Stiff, Clayey silt to silty clay			15	1.56	0.72	3 - 4	3 - 4
13.5	5.5	6.0	0.2	2.9		787	Firm, Silty clay to clay			10	0.95	0.49	1 - 3	1 - 3
14.0	7.9	8.4	0.1	1.7		867	Stiff, Clayey silt to silty clay			10	1.40	0.29	1 - 3	1 - 3
14.5	7.7	8.3	0.3	2.8		590	Stiff, Clayey silt to silty clay			10	1.38	0.54	1 - 3	1 - 3
15.0	5.5	5.9	0.2	2.5		976	Firm, Clayey silt to silty clay			10	0.92	0.40	1 - 3	1 - 3
15.5	5.9	6.3	0.1	1.6		867	Firm, Clayey silt to silty clay			10	1.00	0.27	1 - 3	1 - 3
16.0	7.3	7.7	0.2	1.9		729	Stiff, Clayey silt to silty clay			10	1.26	0.32	1 - 3	1 - 3
16.5	7.7	8.1	0.2	2.3		951	Stiff, Clayey silt to silty clay			10	1.33	0.40	1 - 3	1 - 3
17.0	8.1	8.4	0.2	2.6		724	Stiff, Clayey silt to silty clay			10	1.41	0.48	1 - 3	1 - 3
17.5	11.9	12.5	0.2	1.8		915	Stiff, Sandy silt to clayey silt			15	1.45	0.43	1 - 3	1 - 3
18.0	8.4	8.7	0.4	2.9		832	Stiff, Clayey silt to silty clay			10	1.46	0.75	1 - 3	1 - 3
18.5	8.4	8.7	0.2	2.8		957	Stiff, Clayey silt to silty clay			10	1.46	0.50	1 - 3	1 - 3
19.0	8.1	8.4	0.2	2.8		932	Stiff, Clayey silt to silty clay			10	1.39	0.49	1 - 3	1 - 3
19.5	7.9	8.1	0.2	2.8		911	Stiff, Clayey silt to silty clay			10	1.34	0.47	1 - 3	1 - 3
20.0	8.2	8.5	0.3	2.9		893	Stiff, Silty clay to clay			10	1.41	0.51	1 - 3	1 - 3
20.5	8.4	8.6	0.3	3.0		882	Stiff, Silty clay to clay			10	1.44	0.55	1 - 3	1 - 3

STRATIGRAPHICS

JOB NO: '96-110-220
 - JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp012

PAGE 2

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED		GENERATED PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED LARGE SHEAR STRAIN SHEAR STRENGTH (KSF)		SPT (N)	NORM SPT (N)
			FRICTION (TSF)	RATIO (%)							UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED SHEAR STRENGTH (KSF)		
21.0	8.9	9.1	0.3	2.8		906	Stiff, Clayey silt to silty clay			10	1.53	0.55	1 - 3	1 - 3
21.5	9.8	9.9	0.3	2.8		967	Stiff, Clayey silt to silty clay			15	1.13	0.58	1 - 3	1 - 3
22.0	9.8	9.9	0.3	3.2		1109	Stiff, Silty clay to clay			15	1.13	0.67	3 - 4	3 - 4
22.5	10.0	10.1	0.3	3.2		1118	Stiff, Silty clay to clay			15	1.15	0.68	3 - 4	3 - 4
23.0	10.1	10.1	0.3	3.3		1126	Stiff, Silty clay to clay			15	1.16	0.69	3 - 4	3 - 4
23.5	10.0	10.0	0.3	3.4		1090	Stiff, Silty clay to clay			15	1.14	0.70	3 - 4	3 - 4
24.0	10.0	10.0	0.3	3.3		1125	Stiff, Silty clay to clay			15	1.15	0.69	3 - 4	3 - 4
24.5	9.7	9.7	0.3	3.2		1061	Stiff, Silty clay to clay			15	1.10	0.67	3 - 4	3 - 4
25.0	9.8	9.7	0.3	3.3		1104	Stiff, Silty clay to clay			15	1.10	0.66	3 - 4	3 - 4
25.5	9.6	9.5	0.3	3.2		1064	Stiff, Silty clay to clay			15	1.07	0.64	3 - 4	3 - 4
26.0	9.4	9.3	0.3	3.3		1141	Stiff, Silty clay to clay			15	1.05	0.67	3 - 4	3 - 4
26.5	9.3	9.2	0.3	3.2		1117	Stiff, Silty clay to clay			15	1.03	0.57	3 - 4	3 - 4
27.0	9.6	9.4	0.3	3.4		1152	Stiff, Silty clay to clay			15	1.06	0.70	3 - 4	3 - 4
27.5	9.8	9.6	0.4	3.5		1160	Stiff, Silty clay to clay			15	1.09	0.72	3 - 4	3 - 4
28.0	9.6	9.4	0.3	3.3		1165	Stiff, Silty clay to clay			15	1.06	0.69	3 - 4	3 - 4
28.5	10.0	9.7	0.3	3.3		1156	Stiff, Silty clay to clay			15	1.10	0.70	3 - 4	3 - 4
29.0	10.1	9.8	0.3	3.1		1103	Stiff, Silty clay to clay			15	1.12	0.67	3 - 4	3 - 4
29.5	10.2	9.9	0.3	3.1		1136	Stiff, Silty clay to clay			15	1.13	0.65	3 - 4	3 - 4
30.0	10.0	9.6	0.3	3.2		1132	Stiff, Silty clay to clay			15	1.09	0.67	3 - 4	3 - 4
30.5	10.2	9.8	0.3	3.1		1087	Stiff, Silty clay to clay			15	1.12	0.68	3 - 4	3 - 4
31.0	11.1	10.6	0.3	3.1		1149	Stiff, Silty clay to clay			15	1.23	0.70	3 - 4	3 - 4
31.5	11.0	10.5	0.4	3.1		1057	Stiff, Silty clay to clay			15	1.22	0.71	3 - 4	3 - 4
32.0	11.3	10.8	0.3	2.8		1076	Stiff, Clayey silt to silty clay			15	1.25	0.69	3 - 4	3 - 4
32.5	11.8	11.2	0.4	2.9		1149	Stiff, Clayey silt to silty clay			15	1.31	0.73	3 - 4	3 - 4
33.0	12.3	11.7	0.4	2.9		1093	Stiff, Clayey silt to silty clay			15	1.38	0.74	3 - 4	3 - 4
33.5	11.7	11.1	0.4	3.2		1177	Stiff, Silty clay to clay			15	1.30	0.82	3 - 4	3 - 4
34.0	11.9	11.3	0.4	2.9		1114	Stiff, Clayey silt to silty clay			15	1.32	0.72	3 - 4	3 - 4
34.5	11.9	11.2	0.4	3.1		1165	Stiff, Silty clay to clay			15	1.31	0.79	3 - 4	3 - 4
35.0	12.2	11.4	0.4	3.0		1178	Stiff, Clayey silt to silty clay			15	1.34	0.76	3 - 4	3 - 4
35.5	12.4	11.6	0.4	3.1		1188	Stiff, Clayey silt to silty clay			15	1.37	0.79	3 - 4	3 - 4
36.0	12.3	11.5	0.4	2.9		1100	Stiff, Clayey silt to silty clay			15	1.35	0.75	3 - 4	3 - 4
36.5	12.0	11.2	0.4	3.2		1194	Stiff, Silty clay to clay			15	1.30	0.81	3 - 4	3 - 4
37.0	11.7	10.9	0.4	3.1		1129	Stiff, Silty clay to clay			15	1.27	0.77	3 - 4	3 - 4
37.5	11.9	11.0	0.4	3.1		1184	Stiff, Silty clay to clay			15	1.29	0.76	3 - 4	3 - 4
38.0	11.0	10.2	0.4	3.1		1183	Stiff, Silty clay to clay			15	1.17	0.75	3 - 4	3 - 4
38.5	10.9	10.1	0.4	3.3		1209	Stiff, Silty clay to clay			15	1.14	0.75	3 - 4	3 - 4
39.0	11.1	10.2	0.4	3.2		1264	Stiff, Silty clay to clay			15	1.16	0.74	3 - 4	3 - 4
39.5	11.7	10.7	0.4	0.9		1260	V loose, Silty sand to sandy silt	27-31	0-20				1 - 3	1 - 3
40.0	65.4	59.9	0.9	1.0		485	Med dense, Sand to silty sand	37-40	40-60				16 - 19	15 - 17
40.5	100.8	92.1	1.3	1.1		336	Med dense, Sand to silty sand	40-42	40-60				25 - 33	23 - 30

STRATIGRAPHICS

PAGE 3

JOB NO: '96-110-220

JOB NAME: Zone A Charleston Naval Base, S.C.

SOUNDING NO: cp012

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED		GENERATED PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (Nf)
			FRICTION (TSF)	RATIO (%)										
41.0	117.0	106.7	1.4	1.3		292	Med dense, Sand to silty sand	40-42	40-60				36 - 44	33 - 40
41.5	106.4	96.8	1.3	1.2		253	Med dense, Sand to silty sand	40-42	40-60				33 - 36	30 - 33
42.0	99.4	90.2	1.2	1.1		250	Med dense, Sand to silty sand	37-40	40-60				25 - 33	23 - 30
42.5	59.6	54.0	1.0	1.3		355	Med dense, Silty sand to sandy silt	36-37	40-60				17 - 19	15 - 17
43.0	111.9	101.1	0.7	0.5		356	Med dense, Sand to silty sand	40-42	40-60				25 - 33	23 - 30
43.5	166.8	150.4	1.5	0.8		256	Med dense, Sand to silty sand	40-42	40-60				44 - 51	40 - 46
44.0	175.1	157.6	1.8	1.0		241	Dense, Sand to silty sand	40-42	60-80				51 - 67	46 - 60
44.5	157.5	141.4	1.9	1.1		245	Dense, Sand to silty sand	40-42	60-80				45 - 51	40 - 46
45.0	103.7	92.9	1.4	1.1		239	Med dense, Sand to silty sand	40-42	40-60				26 - 33	23 - 30
45.5	50.8	45.4	1.0	1.4		275	Med dense, Silty sand to sandy silt	36-37	40-60				13 - 17	12 - 15
46.0	46.0	41.0	0.6	0.7		638	Loose, Sand to silty sand	36-37	20-40				8 - 11	7 - 10
46.5	115.3	102.6	0.9	0.8		267	Med dense, Sand to silty sand	40-42	40-60				26 - 34	23 - 30
47.0	100.4	89.1	1.2	1.1		249	Med dense, Sand to silty sand	40-42	40-60				26 - 34	23 - 30
47.5	53.3	47.3	0.9	1.0		275	Loose, Silty sand to sandy silt	36-37	20-40				11 - 14	10 - 12
48.0	120.8	106.8	1.0	0.8		339	Med dense, Sand to silty sand	40-42	40-60				26 - 34	23 - 30
48.5	143.0	126.2	1.4	1.0		372	Med dense, Sand to silty sand	40-42	40-60				37 - 45	33 - 40
49.0	43.8	38.6	1.7	1.9		566	Med dense, Silty sand to sandy silt	27-31	40-60				14 - 17	12 - 15
49.5	19.9	17.5	1.1	2.6		1347	V stiff, Sandy clay to silty clay *			15	2.26	2.18	7 - 8	6 - 7
50.0	14.1	12.4	0.4	2.1		1914	Stiff, Clayey silt to silty clay			15	1.48	0.86	1 - 3	1 - 3
50.5	53.4	46.8	0.5	0.7		1551	Loose, Sand to silty sand	37-40	20-40				8 - 11	7 - 10
51.0	81.2	70.9	1.7	2.2		1638	Dense, Silty sand to sandy silt	36-37	60-80				34 - 38	30 - 33
51.5	94.4	82.3	1.1	1.0		1954	Med dense, Sand to silty sand	37-40	40-60				23 - 26	20 - 23
52.0	112.6	97.9	1.3	0.7		1622	Med dense, Sand to silty sand	40-42	40-60				26 - 34	23 - 30
52.5	220.8	191.7	2.2	0.9		1732	Dense, Sand to silty sand	42-46	60-80				69 - 83	60 - 72
53.0	224.2	194.3	1.1	0.5		1888	Med dense, Sand to silty sand	42-46	40-60				53 - 69	46 - 60
53.5	190.2	164.5	0.7	0.4		2066	Med dense, Sand to silty sand	42-46	40-60				46 - 53	40 - 46
54.0	96.9	83.7	2.6	1.6		1994	Med dense, Silty sand to sandy silt	37-40	40-60				35 - 38	30 - 33
54.5	36.6	31.5	0.7	1.4		2843	Loose, Silty sand to sandy silt	27-31	20-40				8 - 12	7 - 10
55.0	53.8	46.3	0.5	0.9		2413	Loose, Silty sand to sandy silt	36-37	20-40				12 - 14	10 - 12
55.5	52.1	44.7	0.6	1.0		2409	Loose, Silty sand to sandy silt	36-37	20-40				12 - 14	10 - 12
56.0	38.9	33.3	0.6	1.2		2501	Loose, Silty sand to sandy silt	36-37	20-40				8 - 12	7 - 10
56.5	31.9	27.3	0.5	1.3		2690	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
57.0	30.5	26.0	0.4	1.3		2715	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
57.5	28.0	23.9	0.4	1.5		2729	Loose, Silty sand to sandy silt	27-31	20-40				5 - 7	4 - 6
58.0	29.1	24.7	0.5	1.5		2614	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
58.5	30.2	25.6	0.5	1.6		2594	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
59.0	26.2	22.2	0.4	1.6		2568	Loose, Silty sand to sandy silt	27-31	20-40				5 - 7	4 - 6

NOTES: * Indicates lightly overconsolidated soil
 ** Indicates heavily overconsolidated or cemented soil

Mixed soils containing both granular and fine grained particles (e.g. clayey sands) may undergo partial drained failure during CPT. Both undrained and drained parameters can be estimated for these soils.

Structure rate of loading should be considered in choosing which strength parameters to use for design. Drained and undrained parameters must not be combined as such combination will result in significant overprediction of in situ shear strength.

STRATIGRAPHICS

PAGE 1

JOB NO: '96-110-220
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp013

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED		GENERATED PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)		UNDRAINED STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (Nf)
			FRICTION (TSF)	RATIO (%)											
1.00	PREPUNCH														
1.50	PREPUNCH														
2.0	95.4	139.3	1.1	0.8		192	Med dense, Sand to silty sand	40-42	40-60					23 - 27	33 - 40
2.5	29.6	41.9	1.2	2.2		691	Med dense, Silty sand to sandy silt	27-31	40-60					11 - 12	15 - 17
3.0	30.0	41.2	0.7	2.5		804	V stiff, Sandy silt to sandy clay			25	2.39	1.45		12 - 15	17 - 20
3.5	24.9	33.3	0.5	1.7		718	Med dense, Silty sand to sandy silt	27-31	40-60					5 - 7	7 - 10
4.0	17.6	23.1	0.4	1.6		685	Loose, Silty sand to sandy silt	27-31	20-40					5 - 5	6 - 7
4.5	8.8	11.3	0.2	1.6		853	Stiff, Sandy silt to clayey silt			15	1.14	0.42		1 - 2	1 - 3
5.0	12.7	16.1	0.2	1.3		928	Loose, Silty sand to sandy silt	27-31	20-40					2 - 3	3 - 4
5.5	22.4	27.8	0.1	0.4		969	Loose, Silty sand to sandy silt	36-37	20-40					3 - 5	4 - 6
6.0	32.9	40.2	0.1	0.3		732	Loose, Sand to silty sand	37-40	20-40					5 - 6	6 - 7
6.5	27.5	33.1	0.3	0.9		780	Loose, Silty sand to sandy silt	36-37	20-40					5 - 6	6 - 7
7.0	11.3	13.4	0.4	1.7		1066	Stiff, Sandy silt to clayey silt			15	1.45	0.73		1 - 3	1 - 3
7.5	4.5	5.2	0.1	1.3		1582	Soft, Clayey silt to silty clay			18	0.45	0.15		1 - 3	1 - 3
8.0	3.7	4.3	0.0	0.4		3075	Soft, Sensitive fine grained soil			18	0.36	0.06		0 - 1	0 - 1
8.5	26.0	29.8	0.5	3.3		2296	V stiff, Sandy clay to silty clay *			20	2.55	0.91		13 - 15	15 - 17
9.0	4.1	4.7	0.2	2.3		5747	Soft, Clayey silt to silty clay			18	0.40	0.45		1 - 3	1 - 3
9.5	2.9	3.3	0.0	1.0		6492	Soft, Sensitive fine grained soil			18	0.26	0.06		0 - 1	0 - 1
10.0	3.0	3.4	0.0	1.3		7005	Soft, Sensitive fine grained soil			18	0.27	0.08		0 - 1	0 - 1
10.5	2.7	2.9	0.0	1.5		6951	V soft, Sensitive fine grained soil			18	0.23	0.08		0 - 1	0 - 1
11.0	3.2	3.5	0.0	1.4		6519	Soft, Sensitive fine grained soil			18	0.28	0.09		0 - 1	0 - 1
11.5	3.1	3.4	0.1	2.9		8154	Soft, Silty clay to clay			18	0.27	0.20		1 - 3	1 - 3
12.0	3.7	4.1	0.2	4.8		9492	Soft, Clay			18	0.34	0.35		1 - 3	1 - 3
12.5	3.6	3.9	0.2	5.6		10686	Firm, Clay			10	0.57	0.40		1 - 3	1 - 3
13.0	3.0	3.3	0.1	3.0		9608	Soft, Silty clay to clay			18	0.25	0.20		1 - 3	1 - 3
13.5	2.5	2.7	0.0	0.0		6415	V soft, Sensitive fine grained soil			25	0.14	0.00		0 - 1	0 - 1
14.0	20.2	21.7	0.1	0.3		5189	V loose, Silty sand to sandy silt	31-36	0-20					1 - 3	1 - 3
14.5	36.2	38.7	0.3	1.0		4982	Loose, Silty sand to sandy silt	36-37	20-40					7 - 9	7 - 10
15.0	7.9	8.4	0.1	0.4		5265	V loose, Silty sand to sandy silt	27-31	0-20					1 - 3	1 - 3
15.5	5.9	6.2	0.1	1.2		6881	Firm, Sandy silt to clayey silt			10	0.99	0.13		1 - 3	1 - 3
16.0	6.3	6.6	0.1	2.4		7615	Stiff, Clayey silt to silty clay			10	1.06	0.30		1 - 3	1 - 3
16.5	6.1	6.4	0.1	1.6		8298	Stiff, Clayey silt to silty clay			10	1.03	0.19		1 - 3	1 - 3
17.0	7.7	8.0	0.2	3.2		8095	Stiff, Silty clay to clay			10	1.33	0.45		1 - 3	1 - 3
17.5	5.3	5.5	0.1	0.9		7652	Soft, Sandy silt to clayey silt			18	0.47	0.13		1 - 3	1 - 3
18.0	9.3	9.7	0.0	0.5		6503	V loose, Silty sand to sandy silt	27-31	0-20					1 - 3	1 - 3
18.5	10.5	10.8	0.2	1.8		6592	Stiff, Sandy silt to clayey silt			15	1.25	0.38		1 - 3	1 - 3
19.0	11.2	11.5	0.3	2.2		6459	Stiff, Clayey silt to silty clay			15	1.34	0.52		1 - 3	1 - 3
19.5	12.6	13.0	0.5	3.9		6990	Stiff, Silty clay to clay *			15	1.52	1.00		6 - 7	6 - 7
20.0	13.5	13.9	0.5	3.8		6841	Stiff, Silty clay to clay *			15	1.64	1.07		6 - 7	6 - 7
20.5	14.4	14.7	0.6	3.9		6351	Stiff, Silty clay to clay *			15	1.75	1.12		6 - 7	6 - 7

STRATIGRAPHICS

PAGE 2

JOB NO: '96-110-220
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp013

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED FRICTION (TSF)	GENERATED RATIO (%)	PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (N)
21.0	14.9	15.1	0.5	3.6		5967	Stiff, Silty clay to clay *			15	1.81	1.07	6 - 7	6 - 7
21.5	14.9	15.1	0.6	3.7		5065	Stiff, Silty clay to clay *			15	1.81	1.13	6 - 7	6 - 7
22.0	12.2	12.3	0.5	3.9		5010	Stiff, Silty clay to clay *			15	1.45	1.04	6 - 7	6 - 7
22.5	12.5	12.6	0.5	3.8		4377	Stiff, Silty clay to clay *			15	1.49	1.07	6 - 7	6 - 7
23.0	25.6	25.8	0.5	1.0		2637	Loose, Silty sand to sandy silt	31-36	20-40				4 - 6	4 - 6
23.5	56.9	57.0	0.3	0.5		1357	Loose, Sand to silty sand	37-40	20-40				10 - 12	10 - 12
24.0	65.7	65.6	0.5	0.7		865	Loose, Sand to silty sand	37-40	20-40				12 - 15	12 - 15
24.5	68.1	67.8	0.4	0.6		838	Loose, Sand to silty sand	40-42	20-40				15 - 17	15 - 17
25.0	64.3	63.8	0.5	0.7		1002	Loose, Sand to silty sand	37-40	20-40				12 - 15	12 - 15
25.5	95.2	94.2	0.7	0.6		1458	Med dense, Sand to silty sand	40-42	40-60				20 - 23	20 - 23
26.0	125.1	123.4	0.9	0.7		1021	Med dense, Sand to silty sand	40-42	40-60				33 - 41	33 - 40
26.5	123.7	121.7	0.8	0.6		831	Med dense, Sand to silty sand	40-42	40-60				31 - 34	30 - 33
27.0	99.5	97.6	1.1	1.0		1014	Med dense, Sand to silty sand	40-42	40-60				23 - 31	23 - 30
27.5	93.7	91.6	0.9	0.9		1011	Med dense, Sand to silty sand	40-42	40-60				24 - 31	23 - 30
28.0	94.3	91.9	0.8	0.9		962	Med dense, Sand to silty sand	40-42	40-60				24 - 31	23 - 30
28.5	102.1	99.2	0.8	0.8		741	Med dense, Sand to silty sand	40-42	40-60				24 - 31	23 - 30
29.0	108.6	105.3	0.8	0.8		669	Med dense, Sand to silty sand	40-42	40-60				24 - 31	23 - 30
29.5	94.7	91.5	0.9	0.9		647	Med dense, Sand to silty sand	40-42	40-60				24 - 31	23 - 30
30.0	107.8	104.0	0.5	0.4		746	Med dense, Sand to silty sand	40-42	40-60				24 - 31	23 - 30
30.5	82.1	78.9	0.6	0.6		650	Med dense, Sand to silty sand	40-42	40-60				18 - 21	17 - 20
31.0	73.2	70.2	0.6	0.8		703	Med dense, Sand to silty sand	37-40	40-60				16 - 18	15 - 17
31.5	78.6	75.1	0.6	0.8		694	Med dense, Sand to silty sand	40-42	40-60				18 - 21	17 - 20
32.0	79.6	75.9	0.8	1.0		676	Med dense, Sand to silty sand	37-40	40-60				21 - 24	20 - 23
32.5	85.8	81.6	0.8	0.9		734	Med dense, Sand to silty sand	40-42	40-60				21 - 24	20 - 23
33.0	91.0	86.3	0.9	0.9		869	Med dense, Sand to silty sand	40-42	40-60				24 - 32	23 - 30
33.5	95.6	90.4	1.0	1.0		971	Med dense, Sand to silty sand	40-42	40-60				24 - 32	23 - 30
34.0	98.4	92.9	1.0	1.0		1031	Med dense, Sand to silty sand	40-42	40-60				24 - 32	23 - 30
34.5	90.3	85.0	1.0	1.1		1078	Med dense, Sand to silty sand	37-40	40-60				24 - 32	23 - 30
35.0	88.9	83.4	0.8	0.9		970	Med dense, Sand to silty sand	40-42	40-60				21 - 24	20 - 23
35.5	82.9	77.7	0.8	1.0		958	Med dense, Sand to silty sand	37-40	40-60				21 - 25	20 - 23
36.0	75.6	70.7	0.5	0.7		859	Med dense, Sand to silty sand	40-42	40-60				16 - 18	15 - 17
36.5	60.9	56.7	0.5	0.7		845	Loose, Sand to silty sand	37-40	20-40				13 - 16	12 - 15
37.0	47.6	44.3	0.5	0.9		893	Loose, Silty sand to sandy silt	36-37	20-40				8 - 11	7 - 10
37.5	53.3	49.4	0.5	0.8		953	Loose, Sand to silty sand	37-40	20-40				11 - 13	10 - 12
38.0	84.2	77.9	0.5	0.6		728	Med dense, Sand to silty sand	40-42	40-60				18 - 22	17 - 20
38.5	99.1	91.4	0.8	0.8		582	Med dense, Sand to silty sand	40-42	40-60				25 - 33	23 - 30
39.0	92.0	84.7	0.9	0.9		499	Med dense, Sand to silty sand	40-42	40-60				22 - 25	20 - 23
39.5	89.3	82.1	0.8	0.8		507	Med dense, Sand to silty sand	40-42	40-60				22 - 25	20 - 23
40.0	100.4	92.0	0.8	0.7		487	Med dense, Sand to silty sand	40-42	40-60				22 - 25	20 - 23
40.5	109.6	100.2	0.8	0.8		449	Med dense, Sand to silty sand	40-42	40-60				25 - 33	23 - 30

STRATIGRAPHICS

PAGE 3

JOB NO: '96-110-220
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp013

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED GENERATED		SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (N1)
			FRICTION (TSF)	RATIO (%)									
41.0	100.1	91.3	0.8	0.8	455	Med dense, Sand to silty sand	40-42	40-60				25 - 33	23 - 30
41.5	81.8	74.5	0.8	0.8	488	Med dense, Sand to silty sand	37-40	40-60				19 - 22	17 - 20
42.0	52.5	47.6	0.6	0.9	587	Loose, Silty sand to sandy silt	37-40	20-40				11 - 13	10 - 12
42.5	44.9	40.7	0.4	0.9	538	Loose, Silty sand to sandy silt	36-37	20-40				8 - 11	7 - 10
43.0	43.9	39.6	0.4	0.9	461	Loose, Silty sand to sandy silt	36-37	20-40				8 - 11	7 - 10
43.5	42.7	38.5	0.3	0.7	403	Loose, Sand to silty sand	36-37	20-40				7 - 8	6 - 7
44.0	74.0	66.6	0.5	0.6	383	Loose, Sand to silty sand	40-42	20-40				13 - 17	12 - 15
44.5	96.2	86.4	0.9	1.0	388	Med dense, Sand to silty sand	40-42	40-60				26 - 33	23 - 30
45.0	87.3	78.2	0.8	0.9	371	Med dense, Sand to silty sand	37-40	40-60				22 - 26	20 - 23
45.5	93.7	83.7	0.9	1.0	378	Med dense, Sand to silty sand	40-42	40-60				22 - 26	20 - 23
46.0	82.1	73.2	0.8	1.0	396	Med dense, Sand to silty sand	37-40	40-60				19 - 22	17 - 20
46.5	87.2	77.6	0.8	0.8	433	Med dense, Sand to silty sand	40-42	40-60				19 - 22	17 - 20
47.0	86.1	76.5	0.9	0.9	437	Med dense, Sand to silty sand	37-40	40-60				23 - 26	20 - 23
47.5	57.0	50.5	0.6	0.9	567	Loose, Sand to silty sand	37-40	20-40				11 - 14	10 - 12
48.0	33.8	29.9	0.3	0.6	918	Loose, Silty sand to sandy silt	36-37	20-40				5 - 7	4 - 6
48.5	27.1	23.9	0.2	0.8	1468	Loose, Silty sand to sandy silt	31-36	20-40				3 - 5	3 - 4
49.0	24.5	21.6	0.1	0.3	2023	V loose, Silty sand to sandy silt	31-36	0-20				1 - 3	1 - 3
49.5	45.3	39.8	0.5	1.4	2099	Med dense, Silty sand to sandy silt	36-37	40-60				11 - 14	10 - 12
50.0	16.2	14.3	0.8	2.6	2799	Stiff, Clayey silt to silty clay			15	1.77	1.58	5 - 7	4 - 6
50.5	12.6	11.0	0.2	1.8	3383	Stiff, Sandy silt to clayey silt			15	1.27	0.50	1 - 3	1 - 3
51.0	12.1	10.6	0.2	1.7	3651	Stiff, Sandy silt to clayey silt			15	1.20	0.40	1 - 3	1 - 3
51.5	11.9	10.4	0.2	1.5	3861	Stiff, Sandy silt to clayey silt			15	1.17	0.37	1 - 3	1 - 3
52.0	12.1	10.6	0.2	1.0	3945	V loose, Silty sand to sandy silt	27-31	0-20				1 - 3	1 - 3
52.5	27.6	24.0	0.3	1.0	7372	Loose, Silty sand to sandy silt	31-36	20-40				5 - 7	4 - 6
53.0	39.1	33.9	0.5	1.3	6905	Loose, Silty sand to sandy silt	36-37	20-40				8 - 12	7 - 10
53.5	34.2	29.6	0.4	1.0	7805	Loose, Silty sand to sandy silt	36-37	20-40				7 - 8	6 - 7
54.0	35.6	30.7	0.4	0.9	7221	Loose, Silty sand to sandy silt	36-37	20-40				7 - 8	6 - 7
54.5	37.7	32.5	0.3	0.9	7536	Loose, Silty sand to sandy silt	36-37	20-40				7 - 8	6 - 7
55.0	36.6	31.5	0.3	0.9	7789	Loose, Silty sand to sandy silt	36-37	20-40				7 - 8	6 - 7
55.5	41.7	35.8	0.4	0.8	7597	Loose, Silty sand to sandy silt	36-37	20-40				7 - 8	6 - 7
56.0	44.5	38.1	0.0	0.9	7430	Loose, Silty sand to sandy silt	36-37	20-40				8 - 12	7 - 10

NOTES: * Indicates lightly overconsolidated soil
 ** Indicates heavily overconsolidated or cemented soil

Mixed soils containing both granular and fine grained particles (e.g. clayey sands) may undergo partial drained failure during CPT. Both undrained and drained parameters can be estimated for these soils.

Structure rate of loading should be considered in choosing which strength parameters to use for design. Drained and undrained parameters must not be combined as such combination will result in significant overprediction of in situ shear strength.

STRATIGRAPHICS

JOB NO: '96-110-230
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp022

PAGE 1

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED FRICTION (TSF)	GENERATED RATIO (%)	PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (Nf)
1.0	113.3	182.5	1.7	1.5		150	Dense, Sand to silty sand	40-42	60-80				37 - 45	60 - 72
1.5	104.2	158.8	1.4	1.3		206	Dense, Sand to silty sand	40-42	60-80				30 - 39	46 - 60
2.0	63.9	93.4	1.2	1.4		174	Med dense, Silty sand to sandy silt	37-40	40-60				21 - 23	30 - 33
2.5	50.1	70.7	0.9	1.6		150	Med dense, Silty sand to sandy silt	37-40	40-60				16 - 21	23 - 30
3.0	43.1	59.2	0.7	1.5		152	Med dense, Silty sand to sandy silt	36-37	40-60				12 - 15	17 - 20
3.5	46.2	61.8	0.8	1.6		152	Med dense, Silty sand to sandy silt	36-37	40-60				15 - 17	20 - 23
4.0	47.9	62.8	0.8	1.6		161	Med dense, Silty sand to sandy silt	36-37	40-60				15 - 18	20 - 23
4.5	49.9	64.1	0.9	1.9		176	Med dense, Silty sand to sandy silt	36-37	40-60				18 - 23	23 - 30
5.0	43.4	54.8	0.8	1.7		163	Med dense, Silty sand to sandy silt	36-37	40-60				13 - 16	17 - 20
5.5	45.0	55.9	0.5	1.0		201	Med dense, Silty sand to sandy silt	37-40	40-60				10 - 12	12 - 15
6.0	52.5	64.2	0.8	1.4		228	Med dense, Silty sand to sandy silt	37-40	40-60				16 - 19	20 - 23
6.5	55.8	67.2	1.0	1.7		223	Med dense, Silty sand to sandy silt	36-37	40-60				19 - 25	23 - 30
7.0	56.5	67.2	0.8	1.5		196	Med dense, Silty sand to sandy silt	37-40	40-60				17 - 19	20 - 23
7.5	53.2	62.4	1.0	1.8		175	Med dense, Silty sand to sandy silt	36-37	40-60				17 - 20	20 - 23
8.0	41.9	48.6	0.8	1.6		144	Med dense, Silty sand to sandy silt	36-37	40-60				13 - 15	15 - 17
8.5	33.9	38.9	0.6	1.5		139	Med dense, Silty sand to sandy silt	36-37	40-60				9 - 10	10 - 12
9.0	30.2	34.2	0.5	1.6		128	Med dense, Silty sand to sandy silt	27-31	40-60				6 - 9	7 - 10
9.5	31.1	34.9	0.5	1.5		132	Med dense, Silty sand to sandy silt	27-31	40-60				6 - 9	7 - 10
10.0	31.9	35.5	0.5	1.5		136	Med dense, Silty sand to sandy silt	27-31	40-60				6 - 9	7 - 10
10.5	25.5	28.2	0.4	1.4		131	Loose, Silty sand to sandy silt	27-31	20-40				5 - 6	6 - 7
11.0	21.4	23.6	0.4	1.5		136	Loose, Silty sand to sandy silt	27-31	20-40				4 - 5	4 - 6
11.5	15.1	16.6	0.3	1.5		140	Stiff, Sandy silt to clayey silt			15	1.93	0.56	3 - 4	3 - 4
12.0	10.5	11.5	0.1	0.9		130	V loose, Silty sand to sandy silt	27-31	0-20				1 - 3	1 - 3
12.5	9.1	9.9	0.2	1.5		130	Stiff, Sandy silt to clayey silt			10	1.67	0.33	1 - 3	1 - 3
13.0	5.9	6.3	0.1	1.9		146	Stiff, Clayey silt to silty clay			10	1.02	0.26	1 - 3	1 - 3
13.5	6.2	6.7	0.1	2.1		167	Stiff, Clayey silt to silty clay			10	1.08	0.26	1 - 3	1 - 3
14.0	2.7	2.9	0.2	3.9		224	V soft, Clay			18	0.21	0.32	1 - 3	1 - 3
14.5	3.4	3.7	0.1	4.9		226	Soft, Clay			18	0.29	0.27	1 - 3	1 - 3
15.0	1.8	1.9	0.1	5.5		236	V soft, Organics to peat			10	0.19	0.27	0 - 1	0 - 1
15.5	1.8	1.9	0.1	6.7		199	V soft, Organics to peat			10	0.17	0.23	0 - 1	0 - 1
16.0	1.5	1.6	0.1	7.8		203	V soft, Organics to peat			10	0.11	0.24	0 - 1	0 - 1
16.5	1.4	1.5	0.1	7.1		240	V soft, Organics to peat			10	0.09	0.22	0 - 1	0 - 1
17.0	1.2	1.3	0.1	8.7		208	V soft, Organics to peat			10	0.04	0.28	0 - 1	0 - 1
17.5	1.4	1.4	0.1	19.3		359	V soft, Silty clay to clay *			10	0.06	0.26	+ 96	+ 100
18.0	1.1	1.2	0.1	65.7		586	V soft, Clay			10	0.01	0.28	+ 96	+ 100
18.5	1.1	1.2	0.1	110.9		365	V soft, Clay			10	0.00	0.28	+ 97	+ 100
19.0	1.2	1.2	0.1	1.5		381	V soft, Sensitive fine grained soil			25	0.00	0.25	0 - 1	0 - 1
19.5	21.9	22.5	0.3	1.4		329	Loose, Silty sand to sandy silt	27-31	20-40				4 - 6	4 - 6
20.0	33.0	33.8	0.4	0.9		336	Loose, Silty sand to sandy silt	36-37	20-40				6 - 7	6 - 7
20.5	30.6	31.3	0.1	0.4		279	Loose, Sand to silty sand	36-37	20-40				4 - 6	4 - 6

STRATIGRAPHICS

JOB NO: '96-110-230
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp022

PAGE 2

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED FRICTION (TSF)	GENERATED RATIO (%)	PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (Nf)
21.0	25.9	26.3	0.3	0.5		332	Loose, Silty sand to sandy silt	36-37	20-40				4 - 6	4 - 6
21.5	55.1	55.9	0.2	0.4		280	Loose, Sand to silty sand	37-40	20-40				7 - 10	7 - 10
22.0	35.3	35.7	0.1	0.3		279	Loose, Sand to silty sand	37-40	20-40				6 - 7	6 - 7
22.5	34.3	34.5	0.1	0.4		293	Loose, Sand to silty sand	36-37	20-40				4 - 6	4 - 6
23.0	26.7	26.9	0.1	0.4		310	Loose, Silty sand to sandy silt	36-37	20-40				4 - 6	4 - 6
23.5	27.1	27.2	0.2	0.5		310	Loose, Silty sand to sandy silt	36-37	20-40				4 - 6	4 - 6
24.0	9.9	9.9	0.3	1.6		341	Stiff, Sandy silt to clayey silt			10	1.69	0.60	1 - 3	1 - 3
24.5	15.4	15.3	0.1	0.6		549	V loose, Silty sand to sandy silt	31-36	0-20				1 - 3	1 - 3
25.0	14.4	14.3	0.1	0.4		351	V loose, Silty sand to sandy silt	31-36	0-20				1 - 3	1 - 3
25.5	8.2	8.1	0.1	1.4		415	Stiff, Sandy silt to clayey silt			10	1.34	0.25	1 - 3	1 - 3
26.0	5.5	5.4	0.0	0.4		378	Soft, Sensitive fine grained soil			18	0.44	0.06	1 - 3	1 - 3
26.5	23.6	23.2	0.1	0.3		427	V loose, Silty sand to sandy silt	31-36	0-20				3 - 4	3 - 4
27.0	38.7	38.0	0.3	0.5		297	Loose, Sand to silty sand	37-40	20-40				6 - 7	6 - 7
27.5	62.7	61.3	0.1	0.2		267	Loose, Sand to silty sand	40-42	20-40				10 - 12	10 - 12
28.0	55.9	54.5	0.2	0.4		258	Loose, Sand to silty sand	37-40	20-40				7 - 10	7 - 10
28.5	41.4	40.2	0.2	0.3		290	Loose, Sand to silty sand	37-40	20-40				6 - 7	6 - 7
29.0	61.9	60.0	0.0	0.0		274	Loose, Sand to silty sand	40-42	20-40				7 - 10	7 - 10
29.5	36.9	35.7	0.2	0.4		273	Loose, Sand to silty sand	36-37	20-40				6 - 7	6 - 7
30.0	26.3	25.3	2.7	0.3		296	V loose, Silty sand to sandy silt	36-37	0-20				3 - 4	3 - 4

NOTES: * Indicates lightly overconsolidated soil
 ** Indicates heavily overconsolidated or cemented soil

Mixed soils containing both granular and fine grained particles (e.g. clayey sands) may undergo partial drained failure during CPT. Both undrained and drained parameters can be estimated for these soils.

Structure rate of loading should be considered in choosing which strength parameters to use for design. Drained and undrained parameters must not be combined as such combination will result in significant overprediction of in situ shear strength.

STRATIGRAPHICS

PAGE 1

JOB NO: '96-110-230
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp024

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	FRICION (TSF)	GENERATED RATIO (%)	PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (N)
1.0	136.3	219.6	1.6	1.3		233	Dense, Sand to silty sand	42-46	60-80				37 - 45	60 - 72
1.5	98.2	149.6	1.3	1.2		271	Dense, Sand to silty sand	40-42	60-80				30 - 39	46 - 60
2.0	79.4	116.0	1.2	1.3		295	Dense, Sand to silty sand	40-42	60-80				27 - 31	40 - 46
2.5	61.7	87.1	1.0	1.4		384	Med dense, Silty sand to sandy silt	37-40	40-60				21 - 23	30 - 33
3.0	59.0	80.9	0.7	1.2		266	Med dense, Sand to silty sand	37-40	40-60				17 - 22	23 - 30
3.5	50.1	67.1	0.6	1.1		263	Med dense, Silty sand to sandy silt	37-40	40-60				13 - 15	17 - 20
4.0	44.9	58.8	0.4	0.9		270	Med dense, Sand to silty sand	37-40	40-60				9 - 11	12 - 15
4.5	39.7	51.0	0.5	1.2		251	Med dense, Silty sand to sandy silt	36-37	40-60				9 - 12	12 - 15
5.0	35.9	45.3	0.5	1.2		217	Med dense, Silty sand to sandy silt	36-37	40-60				8 - 10	10 - 12
5.5	33.2	41.2	0.4	1.1		225	Loose, Silty sand to sandy silt	36-37	20-40				6 - 8	7 - 10
6.0	26.8	32.8	0.4	1.3		197	Loose, Silty sand to sandy silt	27-31	20-40				6 - 8	7 - 10
6.5	18.7	22.5	0.3	1.4		171	Loose, Silty sand to sandy silt	27-31	20-40				3 - 5	4 - 6
7.0	14.5	17.2	0.2	1.5		211	Loose, Silty sand to sandy silt	27-31	20-40				3 - 3	3 - 4
7.5	7.6	8.9	0.2	1.4		240	Stiff, Sandy silt to clayey silt			10	1.43	0.32	1 - 3	1 - 3
8.0	18.9	22.0	0.1	1.0		234	Loose, Silty sand to sandy silt	31-36	20-40				3 - 3	3 - 4
8.5	15.0	17.2	0.3	1.5		325	Stiff, Sandy silt to clayey silt			15	1.94	0.57	3 - 3	3 - 4
9.0	22.2	25.1	0.1	0.7		259	Loose, Silty sand to sandy silt	31-36	20-40				4 - 5	4 - 6
9.5	7.7	8.6	0.1	0.4		359	V loose, Silty sand to sandy silt	27-31	0-20				1 - 3	1 - 3
10.0	26.8	29.8	0.1	0.4		327	Loose, Sand to silty sand	36-37	20-40				4 - 5	4 - 6
10.5	24.5	27.1	0.1	0.5		294	Loose, Silty sand to sandy silt	36-37	20-40				4 - 5	4 - 6
11.0	47.9	52.7	0.3	0.6		306	Loose, Sand to silty sand	37-40	20-40				9 - 11	10 - 12
11.5	60.9	66.8	0.5	0.8		246	Med dense, Sand to silty sand	37-40	40-60				14 - 16	15 - 17
12.0	52.3	57.1	0.4	0.7		254	Loose, Sand to silty sand	37-40	20-40				9 - 11	10 - 12
12.5	17.8	19.3	0.5	1.5		272	Loose, Silty sand to sandy silt	27-31	20-40				4 - 6	4 - 6
13.0	24.8	26.9	0.1	0.5		408	Loose, Silty sand to sandy silt	36-37	20-40				4 - 6	4 - 6
13.5	23.7	25.5	0.1	0.5		314	Loose, Silty sand to sandy silt	36-37	20-40				3 - 4	3 - 4
14.0	19.7	21.1	0.3	1.1		346	Loose, Silty sand to sandy silt	27-31	20-40				3 - 4	3 - 4
14.5	26.4	28.2	0.1	0.6		353	Loose, Silty sand to sandy silt	36-37	20-40				4 - 6	4 - 6
15.0	20.8	22.1	0.1	0.5		334	Loose, Silty sand to sandy silt	31-36	20-40				3 - 4	3 - 4
15.5	18.1	19.2	0.2	0.7		504	Loose, Silty sand to sandy silt	31-36	20-40				1 - 3	1 - 3
16.0	28.3	29.8	0.2	0.6		273	Loose, Silty sand to sandy silt	36-37	20-40				4 - 6	4 - 6
16.5	31.2	32.8	0.1	0.3		282	Loose, Sand to silty sand	36-37	20-40				4 - 6	4 - 6
17.0	36.0	37.7	0.2	0.6		298	Loose, Sand to silty sand	36-37	20-40				6 - 7	6 - 7
17.5	28.0	29.2	0.1	0.5		277	Loose, Silty sand to sandy silt	36-37	20-40				4 - 6	4 - 6
18.0	14.3	14.9	0.2	0.8		327	V loose, Silty sand to sandy silt	27-31	0-20				1 - 3	1 - 3
18.5	15.6	16.2	0.2	0.9		301	Loose, Silty sand to sandy silt	27-31	20-40				1 - 3	1 - 3
19.0	14.8	15.3	0.1	0.6		349	V loose, Silty sand to sandy silt	31-36	0-20				1 - 3	1 - 3
19.5	20.7	21.3	0.1	0.3		306	V loose, Silty sand to sandy silt	31-36	0-20				1 - 3	1 - 3
20.0	30.9	31.7	0.2	0.6		294	Loose, Silty sand to sandy silt	36-37	20-40				4 - 6	4 - 6
20.5	12.9	13.2	0.1	0.6		273	V loose, Silty sand to sandy silt	31-36	0-20				1 - 3	1 - 3

STRATIGRAPHICS

PAGE 2

JOB NO: '96-110-230
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp024

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED		GENERATED PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (Nf)
			FRICTION (TSF)	RATIO (%)										
21.0	10.4	10.6	0.1	0.4		294	V loose, Silty sand to sandy silt	27-31	0-20				1 - 3	1 - 3
21.5	25.6	26.0	0.2	0.6		282	Loose, Silty sand to sandy silt	36-37	20-40				4 - 6	4 - 6
22.0	25.3	25.6	0.1	0.5		250	Loose, Silty sand to sandy silt	36-37	20-40				3 - 4	3 - 4
22.5	20.1	20.3	0.1	0.4		261	V loose, Silty sand to sandy silt	31-36	0-20				1 - 3	1 - 3
23.0	26.1	26.2	0.1	0.5		245	Loose, Silty sand to sandy silt	36-37	20-40				3 - 4	3 - 4
23.5	27.1	27.1	0.3	1.1		243	Loose, Silty sand to sandy silt	31-36	20-40				6 - 7	6 - 7
24.0	27.0	27.0	0.5	1.6		267	Loose, Silty sand to sandy silt	27-31	20-40				6 - 7	6 - 7
24.5	34.1	34.0	0.4	0.8		273	Loose, Silty sand to sandy silt	36-37	20-40				6 - 7	6 - 7
25.0	49.9	49.5	0.7	1.2		252	Med dense, Silty sand to sandy silt	36-37	40-60				12 - 15	12 - 15
25.5	58.4	57.8	0.8	1.3		265	Med dense, Silty sand to sandy silt	36-37	40-60				15 - 17	15 - 17
26.0	39.5	39.0	0.8	1.6		365	Med dense, Silty sand to sandy silt	36-37	40-60				10 - 12	10 - 12
26.5	30.2	29.7	0.2	0.6		406	Loose, Silty sand to sandy silt	36-37	20-40				4 - 6	4 - 6
27.0	35.6	35.0	0.4	1.1		328	Loose, Silty sand to sandy silt	36-37	20-40				7 - 10	7 - 10
27.5	24.2	23.6	0.3	1.1		393	Loose, Silty sand to sandy silt	27-31	20-40				4 - 6	4 - 6
28.0	29.0	28.2	0.4	1.3		391	Loose, Silty sand to sandy silt	27-31	20-40				6 - 7	6 - 7
28.5	26.5	25.7	0.3	1.2		401	Loose, Silty sand to sandy silt	27-31	20-40				4 - 6	4 - 6
29.0	28.0	27.1	0.4	1.5		394	Loose, Silty sand to sandy silt	27-31	20-40				6 - 7	6 - 7
29.5	28.4	27.4	0.4	1.5		375	Loose, Silty sand to sandy silt	27-31	20-40				6 - 7	6 - 7
30.0	24.0	23.2	0.4	1.4		387	Loose, Silty sand to sandy silt	27-31	20-40				4 - 6	4 - 6
30.5	20.0	19.3	0.5	2.1		408	V stiff, Sandy silt to sandy clay			15	2.43	0.92	4 - 6	4 - 6
31.0	18.9	18.2	0.5	2.4		424	V stiff, Sandy clay to silty clay *			15	2.28	0.97	6 - 7	6 - 7
31.5	20.9	19.9	0.5	2.5		411	V stiff, Sandy clay to silty clay *			15	2.53	1.09	6 - 7	6 - 7
32.0	22.5	21.4	0.5	2.3		359	V stiff, Sandy silt to sandy clay			15	2.74	1.07	6 - 7	6 - 7
32.5	25.3	24.1	0.6	2.0		348	V stiff, Sandy silt to sandy clay			20	2.34	1.15	6 - 7	6 - 7
33.0	35.9	34.0	0.6	1.9		327	Med dense, Silty sand to sandy silt	27-31	40-60				11 - 13	10 - 12
33.5	32.3	30.5	0.5	1.6		317	Med dense, Silty sand to sandy silt	27-31	40-60				7 - 11	7 - 10
34.0	20.7	19.5	0.5	1.8		343	V stiff, Sandy silt to clayey silt			15	2.48	0.91	4 - 6	4 - 6
34.5	19.4	18.3	0.5	2.3		348	V stiff, Sandy silt to sandy clay			15	2.31	0.96	4 - 6	4 - 6
35.0	20.9	19.6	0.5	2.2		355	V stiff, Sandy silt to sandy clay			15	2.51	0.99	6 - 7	6 - 7
35.5	24.0	22.5	0.5	2.2		367	V stiff, Sandy silt to sandy clay			20	2.19	1.07	6 - 7	6 - 7
36.0	23.8	22.3	0.5	2.2		372	V stiff, Sandy silt to sandy clay			20	2.17	1.07	6 - 7	6 - 7
36.5	20.5	19.1	0.4	2.0		393	V stiff, Sandy silt to clayey silt			15	2.45	0.89	4 - 6	4 - 6
37.0	21.2	19.7	0.5	2.1		404	V stiff, Sandy silt to sandy clay			15	2.53	0.93	4 - 6	4 - 6
37.5	25.3	23.5	0.6	2.0		354	V stiff, Sandy silt to sandy clay			20	2.31	1.12	6 - 8	6 - 7
38.0	28.4	26.2	0.6	2.1		335	V stiff, Sandy silt to sandy clay			20	2.61	1.14	8 - 11	7 - 10
38.5	23.4	21.6	0.5	2.2		338	V stiff, Sandy silt to sandy clay			15	2.81	1.09	7 - 8	6 - 7
39.0	23.3	21.5	0.5	2.3		342	V stiff, Sandy silt to sandy clay			15	2.80	1.08	7 - 8	6 - 7
39.5	22.0	20.2	0.5	2.0		373	V stiff, Sandy silt to sandy clay			15	2.61	0.92	7 - 8	6 - 7
40.0	21.4	19.6	0.5	2.2		335	V stiff, Sandy silt to sandy clay			15	2.53	0.94	7 - 8	6 - 7
40.5	20.8	19.0	0.4	2.1		340	V stiff, Sandy silt to clayey silt			15	2.45	0.88	4 - 7	4 - 6

STRATIGRAPHICS

PAGE 3

JOB NO: '96-110-230
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp024

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED		PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED LARGE SHEAR STRENGTH (KSF)		SPT (N)	NORM SPT (Nf)
			FRICTION (TSF)	RATIO (%)							UNDRAINED SHEAR STRENGTH (KSF)	STRAIN SHEAR STRENGTH (KSF)		
41.0	20.8	19.0	0.5	2.3		327	V stiff, Sandy silt to sandy clay			15	2.45	0.96	7 - 8	6 - 7
41.5	21.4	19.5	0.5	2.1		329	V stiff, Sandy silt to sandy clay			15	2.52	0.95	4 - 7	4 - 6
42.0	23.4	21.3	0.5	2.2		321	V stiff, Sandy silt to sandy clay			15	2.79	1.01	7 - 8	6 - 7
42.5	23.7	21.5	0.5	2.2		302	V stiff, Sandy silt to sandy clay			15	2.82	1.10	7 - 8	6 - 7
43.0	25.2	22.8	0.6	2.1		301	V stiff, Sandy silt to sandy clay			20	2.27	1.11	7 - 8	6 - 7
43.5	27.8	25.1	0.5	1.8		299	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
44.0	33.8	30.4	0.5	1.8		288	Med dense, Silty sand to sandy silt	27-31	40-60				8 - 11	7 - 10
44.5	27.5	24.7	0.5	1.6		297	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
45.0	29.3	26.2	0.5	1.6		307	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
45.5	33.5	30.0	0.6	1.7		286	Med dense, Silty sand to sandy silt	27-31	40-60				8 - 11	7 - 10
46.0	38.0	33.9	0.6	1.6		265	Med dense, Silty sand to sandy silt	27-31	40-60				8 - 11	7 - 10
46.5	41.1	36.6	0.6	1.5		266	Med dense, Silty sand to sandy silt	27-31	40-60				8 - 11	7 - 10
47.0	40.6	36.0	0.6	1.5		261	Med dense, Silty sand to sandy silt	27-31	40-60				8 - 11	7 - 10
47.5	37.8	33.5	0.5	1.4		263	Loose, Silty sand to sandy silt	27-31	20-40				8 - 11	7 - 10
48.0	32.1	28.4	0.5	1.5		255	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
48.5	27.3	24.1	0.5	1.7		255	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
49.0	25.2	22.2	0.4	1.6		254	Loose, Silty sand to sandy silt	27-31	20-40				5 - 7	4 - 6
49.5	24.1	21.2	0.5	2.0		263	V stiff, Sandy silt to sandy clay			15	2.82	1.00	7 - 8	6 - 7
50.0	27.2	23.9	0.5	2.0		272	V stiff, Sandy silt to sandy clay			20	2.42	1.07	7 - 8	6 - 7
50.5	26.6	23.3	0.6	2.4		331	V stiff, Sandy silt to sandy clay			20	2.35	1.29	8 - 11	7 - 10
51.0	27.7	24.2	0.7	2.4		344	V stiff, Sandy silt to sandy clay			20	2.46	1.40	8 - 11	7 - 10
51.5	29.6	25.9	0.9	3.0		351	V stiff, Sandy clay to silty clay *			20	2.66	1.80	11 - 14	10 - 12
52.0	30.7	26.7	0.9	3.0		362	V stiff, Sandy clay to silty clay *			20	2.75	1.89	11 - 14	10 - 12
52.5	31.7	27.5	1.1	3.4		367	V stiff, Sandy clay to silty clay *			20	2.86	2.17	14 - 17	12 - 15
53.0	30.9	26.8	1.0	3.2		364	V stiff, Sandy clay to silty clay *			20	2.77	2.00	14 - 17	12 - 15
53.5	29.4	25.5	0.9	3.0		352	V stiff, Sandy clay to silty clay *			20	2.62	1.85	12 - 14	10 - 12
54.0	29.4	25.3	0.7	2.5		328	V stiff, Sandy silt to sandy clay			20	2.61	1.47	8 - 12	7 - 10
54.5	27.6	23.7	0.6	2.0		286	V stiff, Sandy silt to sandy clay			20	2.43	1.14	7 - 8	6 - 7
55.0	25.4	21.8	0.5	1.9		272	V stiff, Sandy silt to sandy clay			15	2.94	0.98	7 - 8	6 - 7
55.5	23.9	20.5	0.5	2.0		288	V stiff, Sandy silt to sandy clay			15	2.74	0.96	7 - 8	6 - 7
56.0	23.1	19.8	0.5	2.1		309	V stiff, Sandy silt to sandy clay			15	2.64	0.98	5 - 7	4 - 6
56.5	23.0	19.7	0.4	1.9		312	V stiff, Sandy silt to clayey silt			15	2.62	0.87	5 - 7	4 - 6
57.0	23.0	19.6	0.5	2.0		335	V stiff, Sandy silt to clayey silt			15	2.61	0.97	5 - 7	4 - 6
57.5	23.9	20.4	0.5	1.9		314	V stiff, Sandy silt to clayey silt			15	2.73	0.91	5 - 7	4 - 6
58.0	25.0	21.2	0.5	1.7		313	V stiff, Sandy silt to clayey silt			15	2.86	0.92	5 - 7	4 - 6
58.5	27.1	23.0	0.4	1.4		281	Loose, Silty sand to sandy silt	27-31	20-40				5 - 7	4 - 6
59.0	26.7	22.7	0.5	1.9		279	V stiff, Sandy silt to sandy clay			20	2.32	1.03	7 - 8	6 - 7
59.5	24.4	20.7	0.5	2.1		281	V stiff, Sandy silt to sandy clay			15	2.78	1.07	7 - 8	6 - 7
60.0	23.8	20.1	0.5	2.0		299	V stiff, Sandy silt to sandy clay			15	2.70	0.98	5 - 7	4 - 6
60.5	24.3	20.4	0.4	1.9		288	V stiff, Sandy silt to clayey silt			15	2.75	0.87	5 - 7	4 - 6

NOTES: * Indicates lightly overconsolidated soil
 ** Indicates heavily overconsolidated or cemented soil

Mixed soils containing both granular and fine grained particles (e.g. clayey sands)
 may undergo partial drained failure during CPT. Both undrained and drained
 parameters can be estimated for these soils.

Structure rate of loading should be considered in choosing which strength parameters
 to use for design. Drained and undrained parameters must not be combined as such

STRATIGRAPHICS

JOB NO: '96-110-230
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp025

PAGE 1

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED GENERATED		SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)		SPT (N)	NORM SPT (Nf)
			FRICTION (TSF)	RATIO (%)						UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED SHEAR STRENGTH (KSF)		
1.0	156.8	252.5	2.3	1.5	1217	V dense, Sand to silty sand	42-46	80-100				45 - 61	72 - 99
1.5	76.0	115.7	1.9	1.8	1339	Dense, Silty sand to sandy silt	37-40	60-80				30 - 39	46 - 60
2.0	100.5	146.7	1.5	1.6	1370	Dense, Sand to silty sand	40-42	60-80				41 - 49	60 - 72
2.5	62.5	88.3	1.0	1.2	1406	Med dense, Sand to silty sand	37-40	40-60				16 - 21	23 - 30
3.0	40.4	55.4	0.9	1.8	1445	Med dense, Silty sand to sandy silt	36-37	40-60				12 - 15	17 - 20
3.5	36.2	48.5	0.6	1.5	1398	Med dense, Silty sand to sandy silt	36-37	40-60				9 - 11	12 - 15
4.0	12.5	16.4	0.5	2.2	1584	Stiff, Sandy silt to clayey silt			15	1.63	1.03	3 - 5	4 - 6
4.5	12.2	15.6	0.4	2.8	1373	Stiff, Sandy clay to silty clay *			15	1.59	0.80	3 - 5	4 - 6
5.0	14.5	18.2	0.7	4.5	1106	Stiff, Silty clay to clay *			15	1.89	1.30	8 - 10	10 - 12
5.5	13.0	16.1	0.6	4.2	1017	Stiff, Silty clay to clay *			15	1.68	1.14	6 - 8	7 - 10
6.0	10.4	12.7	0.6	4.8	909	Stiff, Silty clay to clay *			15	1.34	1.17	6 - 8	7 - 10
6.5	10.2	12.3	0.5	4.4	1012	Stiff, Silty clay to clay *			15	1.31	1.05	5 - 6	6 - 7
7.0	12.9	15.3	0.5	3.5	1099	Stiff, Silty clay to clay *			15	1.66	0.97	5 - 6	6 - 7
7.5	17.0	20.0	0.5	1.9	1160	V stiff, Sandy silt to clayey silt			15	2.21	0.96	3 - 5	4 - 6
8.0	36.1	41.9	0.4	0.9	888	Loose, Silty sand to sandy silt	36-37	20-40				6 - 9	7 - 10
8.5	46.7	53.6	0.3	0.6	809	Loose, Sand to silty sand	37-40	20-40				9 - 10	10 - 12
9.0	56.1	63.6	0.3	0.6	680	Loose, Sand to silty sand	37-40	20-40				11 - 13	12 - 15
9.5	25.9	29.1	0.5	1.2	715	Loose, Silty sand to sandy silt	27-31	20-40				5 - 6	6 - 7
10.0	10.5	11.7	0.5	3.0	938	Stiff, Clayey silt to silty clay			15	1.32	0.97	3 - 4	3 - 4
10.5	24.0	26.6	0.2	0.9	862	Loose, Silty sand to sandy silt	31-36	20-40				4 - 5	4 - 6
11.0	27.0	29.7	0.1	0.4	715	Loose, Sand to silty sand	36-37	20-40				4 - 5	4 - 6
11.5	36.9	40.5	0.1	0.2	657	Loose, Sand to silty sand	37-40	20-40				5 - 6	6 - 7
12.0	67.9	74.0	0.4	0.4	589	Loose, Sand to silty sand	40-42	20-40				14 - 16	15 - 17
12.5	108.6	118.0	0.9	0.8	493	Med dense, Sand to silty sand	40-42	40-60				28 - 30	30 - 33
13.0	133.3	144.1	1.2	0.9	464	Med dense, Sand to silty sand	40-42	40-60				37 - 43	40 - 46
13.5	146.7	158.0	1.5	1.0	448	Dense, Sand to silty sand	40-42	60-80				43 - 56	46 - 60
14.0	156.6	167.9	1.5	0.9	442	Dense, Sand to silty sand	42-46	60-80				43 - 56	46 - 60
14.5	161.9	172.9	1.7	1.1	448	Dense, Sand to silty sand	42-46	60-80				43 - 56	46 - 60
15.0	149.2	158.7	1.7	1.1	449	Dense, Sand to silty sand	40-42	60-80				43 - 56	46 - 60
15.5	146.8	155.5	1.2	0.8	457	Med dense, Sand to silty sand	42-46	40-60				38 - 43	40 - 46
16.0	127.4	134.5	1.1	0.8	443	Med dense, Sand to silty sand	40-42	40-60				31 - 38	33 - 40
16.5	133.9	140.8	1.1	0.8	489	Med dense, Sand to silty sand	40-42	40-60				38 - 44	40 - 46
17.0	147.6	154.6	1.3	0.9	443	Med dense, Sand to silty sand	40-42	40-60				38 - 44	40 - 46
17.5	146.1	152.5	1.7	1.1	464	Dense, Sand to silty sand	40-42	60-80				44 - 57	46 - 60
18.0	137.5	143.0	1.6	1.1	436	Dense, Sand to silty sand	40-42	60-80				44 - 58	46 - 60
18.5	127.0	131.6	1.6	1.2	442	Dense, Sand to silty sand	40-42	60-80				39 - 44	40 - 46
19.0	134.2	138.5	1.5	1.1	436	Dense, Sand to silty sand	40-42	60-80				39 - 45	40 - 46
19.5	143.4	147.6	1.6	1.1	442	Dense, Sand to silty sand	40-42	60-80				45 - 58	46 - 60
20.0	125.3	128.4	1.5	1.1	436	Med dense, Sand to silty sand	40-42	40-60				39 - 45	40 - 46
20.5	117.8	120.4	1.2	1.0	467	Med dense, Sand to silty sand	40-42	40-60				32 - 39	33 - 40

STRATIGRAPHICS

PAGE 2

JOB NO: '96-110-230
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp025

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED		GENERATED PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (Nf)
			FRICTION (TSF)	RATIO (%)										
21.0	105.2	107.1	1.2	1.1		444	Med dense, Sand to silty sand	40-42	40-60				29 - 32	30 - 33
21.5	97.5	99.0	1.2	1.1		436	Med dense, Sand to silty sand	40-42	40-60				30 - 33	30 - 33
22.0	103.0	104.2	1.1	0.9		464	Med dense, Sand to silty sand	40-42	40-60				30 - 33	30 - 33
22.5	127.3	128.4	1.4	1.1		448	Med dense, Sand to silty sand	40-42	40-60				40 - 46	40 - 46
23.0	123.7	124.3	1.3	1.1		403	Med dense, Sand to silty sand	40-42	40-60				33 - 40	33 - 40
23.5	111.1	111.3	1.2	1.0		387	Med dense, Sand to silty sand	40-42	40-60				30 - 33	30 - 33
24.0	116.5	116.3	1.3	1.1		386	Med dense, Sand to silty sand	40-42	40-60				33 - 40	33 - 40
24.5	119.8	119.3	1.3	1.1		398	Med dense, Sand to silty sand	40-42	40-60				33 - 40	33 - 40
25.0	121.6	120.7	1.3	1.1		401	Med dense, Sand to silty sand	40-42	40-60				33 - 40	33 - 40
25.5	115.9	114.7	1.3	1.1		426	Med dense, Sand to silty sand	40-42	40-60				33 - 40	33 - 40
26.0	106.9	105.4	1.4	1.2		411	Med dense, Sand to silty sand	40-42	40-60				30 - 33	30 - 33
26.5	22.6	22.3	1.1	1.9		418	V stiff, Sandy silt to sandy clay			15	2.81	2.20	6 - 7	6 - 7
27.0	49.1	48.1	0.8	1.9		551	Med dense, Silty sand to sandy silt	36-37	40-60				15 - 17	15 - 17
27.5	51.0	49.9	1.1	1.7		628	Med dense, Silty sand to sandy silt	36-37	40-60				15 - 17	15 - 17
28.0	82.9	80.8	0.9	1.2		529	Med dense, Sand to silty sand	37-40	40-60				24 - 31	23 - 30
28.5	46.5	45.2	1.3	1.6		522	Med dense, Silty sand to sandy silt	36-37	40-60				12 - 15	12 - 15
29.0	94.6	91.7	1.2	1.4		538	Med dense, Silty sand to sandy silt	37-40	40-60				31 - 34	30 - 33
29.5	28.6	27.6	1.2	2.3		518	V stiff, Sandy silt to sandy clay			20	2.68	2.45	7 - 10	7 - 10
30.0	36.6	35.3	0.4	1.4		576	Loose, Silty sand to sandy silt	27-31	20-40				7 - 10	7 - 10
30.5	18.2	17.5	0.9	3.2		740	V stiff, Sandy clay to silty clay *			15	2.19	1.79	6 - 7	6 - 7
31.0	17.5	16.8	0.6	2.9		789	V stiff, Sandy clay to silty clay *			15	2.08	1.19	6 - 7	6 - 7
31.5	17.6	16.8	0.5	2.7		716	V stiff, Sandy clay to silty clay *			15	2.09	1.07	6 - 7	6 - 7
32.0	21.3	20.3	0.3	1.0		650	Loose, Silty sand to sandy silt	27-31	20-40				3 - 4	3 - 4
32.5	33.0	31.4	0.3	0.8		603	Loose, Silty sand to sandy silt	36-37	20-40				6 - 7	6 - 7
33.0	31.0	29.4	0.2	0.8		602	Loose, Silty sand to sandy silt	36-37	20-40				4 - 6	4 - 6
33.5	29.5	27.9	0.2	0.7		584	Loose, Silty sand to sandy silt	36-37	20-40				4 - 6	4 - 6
34.0	28.2	26.6	0.3	0.9		573	Loose, Silty sand to sandy silt	31-36	20-40				4 - 6	4 - 6
34.5	32.1	30.2	0.3	0.7		559	Loose, Silty sand to sandy silt	36-37	20-40				4 - 6	4 - 6
35.0	35.5	33.3	0.2	0.6		552	Loose, Silty sand to sandy silt	36-37	20-40				6 - 7	6 - 7
35.5	42.1	39.4	0.2	0.5		546	Loose, Sand to silty sand	37-40	20-40				6 - 7	6 - 7
36.0	29.9	28.0	0.0	0.1		560	V loose, Sand to silty sand	36-37	0-20				3 - 4	3 - 4
36.5	28.6	26.7	0.1	0.5		551	Loose, Silty sand to sandy silt	36-37	20-40				4 - 6	4 - 6
37.0	28.7	26.7	0.1	0.5		535	Loose, Silty sand to sandy silt	36-37	20-40				4 - 6	4 - 6
37.5	30.5	28.3	0.2	0.7		524	Loose, Silty sand to sandy silt	36-37	20-40				4 - 6	4 - 6
38.0	33.6	31.1	0.3	0.7		521	Loose, Silty sand to sandy silt	36-37	20-40				4 - 6	4 - 6
38.5	39.3	36.3	0.3	0.6		513	Loose, Silty sand to sandy silt	36-37	20-40				7 - 8	6 - 7
39.0	36.0	33.1	0.2	0.5		519	Loose, Silty sand to sandy silt	36-37	20-40				7 - 8	6 - 7
39.5	34.2	31.5	0.2	0.6		523	Loose, Silty sand to sandy silt	36-37	20-40				4 - 7	4 - 6
40.0	41.2	37.8	0.3	0.6		508	Loose, Sand to silty sand	36-37	20-40				7 - 8	6 - 7
40.5	44.8	41.0	0.3	0.7		497	Loose, Silty sand to sandy silt	36-37	20-40				8 - 11	7 - 10

STRATIGRAPHICS

PAGE 3

JOB NO: '96-110-230
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp025

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED FRICTION (TSF)	GENERATED RATIO (%)	PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (Nf)
41.0	48.4	44.2	0.3	0.6		497	Loose, Sand to silty sand	37-40	20-40				8 - 11	7 - 10
41.5	48.6	44.2	0.3	0.5		497	Loose, Sand to silty sand	37-40	20-40				8 - 11	7 - 10
42.0	41.4	37.6	0.1	0.2		497	Loose, Sand to silty sand	37-40	20-40				7 - 8	6 - 7
42.5	35.4	32.1	0.1	0.3		501	Loose, Sand to silty sand	36-37	20-40				4 - 7	4 - 6
43.0	30.9	27.9	0.3	0.7		497	Loose, Silty sand to sandy silt	36-37	20-40				4 - 7	4 - 6
43.5	32.0	28.9	0.3	0.9		493	Loose, Silty sand to sandy silt	36-37	20-40				7 - 8	6 - 7
44.0	32.8	29.6	0.3	0.9		489	Loose, Silty sand to sandy silt	36-37	20-40				7 - 8	6 - 7
44.5	30.6	27.5	0.3	0.8		502	Loose, Silty sand to sandy silt	36-37	20-40				4 - 7	4 - 6
45.0	30.1	27.0	0.4	1.2		530	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
45.5	30.0	26.8	0.5	1.6		552	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
46.0	31.7	28.3	0.7	2.0		561	V stiff, Sandy silt to sandy clay			20	2.89	1.31	8 - 11	7 - 10
46.5	32.3	28.8	0.8	2.5		558	V stiff, Sandy silt to sandy clay			20	2.96	1.67	11 - 13	10 - 12
47.0	31.7	28.1	0.8	2.6		563	V stiff, Sandy silt to sandy clay			20	2.89	1.69	11 - 14	10 - 12
47.5	32.4	28.7	0.8	2.5		563	V stiff, Sandy silt to sandy clay			20	2.95	1.63	11 - 14	10 - 12
48.0	31.2	27.6	0.8	2.3		552	V stiff, Sandy silt to sandy clay			20	2.83	1.50	8 - 11	7 - 10
48.5	30.0	26.4	0.6	2.0		546	V stiff, Sandy silt to sandy clay			20	2.71	1.23	8 - 11	7 - 10
49.0	30.0	26.4	0.4	1.2		528	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
49.5	28.4	25.0	0.2	0.8		508	Loose, Silty sand to sandy silt	31-36	20-40				5 - 7	4 - 6
50.0	27.1	23.8	0.3	1.1		513	Loose, Silty sand to sandy silt	27-31	20-40				5 - 7	4 - 6
50.5	26.7	23.4	0.3	1.1		514	Loose, Silty sand to sandy silt	27-31	20-40				5 - 7	4 - 6
51.0	25.4	22.2	0.3	1.2		533	Loose, Silty sand to sandy silt	27-31	20-40				5 - 7	4 - 6
51.5	26.0	22.7	0.4	1.4		536	Loose, Silty sand to sandy silt	27-31	20-40				5 - 7	4 - 6
52.0	25.6	22.3	0.3	1.2		535	Loose, Silty sand to sandy silt	27-31	20-40				5 - 7	4 - 6
52.5	26.6	23.1	0.3	1.2		532	Loose, Silty sand to sandy silt	27-31	20-40				5 - 7	4 - 6
53.0	27.9	24.2	0.4	1.3		519	Loose, Silty sand to sandy silt	27-31	20-40				5 - 7	4 - 6
53.5	30.3	26.2	0.3	1.2		502	Loose, Silty sand to sandy silt	27-31	20-40				5 - 7	4 - 6
54.0	28.5	24.6	0.4	1.2		507	Loose, Silty sand to sandy silt	27-31	20-40				5 - 7	4 - 6
54.5	27.3	23.5	0.3	1.3		509	Loose, Silty sand to sandy silt	27-31	20-40				5 - 7	4 - 6
55.0	27.1	23.3	0.4	1.3		520	Loose, Silty sand to sandy silt	27-31	20-40				5 - 7	4 - 6
55.5	29.9	25.6	0.4	1.3		504	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
56.0	32.3	27.7	0.4	1.4		502	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7

NOTES: * Indicates lightly overconsolidated soil
 ** Indicates heavily overconsolidated or cemented soil

Mixed soils containing both granular and fine grained particles (e.g. clayey sands) may undergo partial drained failure during CPT. Both undrained and drained parameters can be estimated for these soils.

Structure rate of loading should be considered in choosing which strength parameters to use for design. Drained and undrained parameters must not be combined as such combination will result in significant overprediction of in situ shear strength.

STRATIGRAPHICS

JOB NO: '96-110-230
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp029

PAGE 1

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED FRICTION (TSF)	GENERATED RATIO (%)	PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (Nf)
1.0	76.4	123.1	1.4	1.3		806	Dense, Sand to silty sand	40-42	60-80				25 - 29	40 - 46
1.5	30.8	47.0	0.4	0.9		929	Loose, Silty sand to sandy silt	37-40	20-40				7 - 8	10 - 12
2.0	18.7	27.4	0.2	0.9		959	Loose, Silty sand to sandy silt	31-36	20-40				3 - 4	4 - 6
2.5	14.5	20.5	0.2	1.1		926	Loose, Silty sand to sandy silt	27-31	20-40				2 - 3	3 - 4
3.0	15.5	21.3	0.1	0.9		904	Loose, Silty sand to sandy silt	31-36	20-40				2 - 3	3 - 4
3.5	11.1	14.9	0.1	0.7		872	V loose, Silty sand to sandy silt	31-36	0-20				1 - 2	1 - 3
4.0	6.5	8.5	0.1	1.2		873	Stiff, Sandy silt to clayey silt			10	1.25	0.22	1 - 2	1 - 3
4.5	8.2	10.5	0.1	0.5		722	V loose, Silty sand to sandy silt	27-31	0-20				1 - 2	1 - 3
5.0	28.6	36.1	0.4	0.8		669	Loose, Silty sand to sandy silt	36-37	20-40				5 - 6	6 - 7
5.5	64.6	80.2	0.8	1.0		640	Med dense, Sand to silty sand	37-40	40-60				16 - 19	20 - 23
6.0	99.3	121.3	1.3	1.2		630	Dense, Sand to silty sand	40-42	60-80				33 - 38	40 - 46
6.5	96.9	116.8	1.6	1.6		636	Dense, Silty sand to sandy silt	37-40	60-80				33 - 38	40 - 46
7.0	79.0	93.9	1.1	1.2		613	Med dense, Sand to silty sand	37-40	40-60				25 - 28	30 - 33
7.5	55.4	65.0	1.0	1.6		576	Med dense, Silty sand to sandy silt	36-37	40-60				17 - 20	20 - 23
8.0	46.3	53.7	0.8	1.6		549	Med dense, Silty sand to sandy silt	36-37	40-60				15 - 17	17 - 20
8.5	44.6	51.2	0.7	1.5		519	Med dense, Silty sand to sandy silt	36-37	40-60				13 - 15	15 - 17
9.0	44.5	50.5	0.7	1.6		514	Med dense, Silty sand to sandy silt	36-37	40-60				13 - 15	15 - 17
9.5	42.3	47.5	0.7	1.5		480	Med dense, Silty sand to sandy silt	36-37	40-60				11 - 13	12 - 15
10.0	37.9	42.1	0.6	1.4		459	Med dense, Silty sand to sandy silt	36-37	40-60				9 - 11	10 - 12
10.5	31.5	34.8	0.5	1.3		475	Loose, Silty sand to sandy silt	36-37	20-40				6 - 9	7 - 10
11.0	27.3	30.1	0.5	1.6		442	Loose, Silty sand to sandy silt	27-31	20-40				6 - 9	7 - 10
11.5	23.6	25.8	0.4	1.4		431	Loose, Silty sand to sandy silt	27-31	20-40				5 - 6	6 - 7
12.0	17.7	19.3	0.2	1.0		424	Loose, Silty sand to sandy silt	27-31	20-40				3 - 4	3 - 4
12.5	11.2	12.2	0.2	1.1		437	V loose, Silty sand to sandy silt	27-31	0-20				1 - 3	1 - 3
13.0	11.4	12.4	0.2	1.2		504	Stiff, Sandy silt to clayey silt			15	1.42	0.31	1 - 3	1 - 3
13.5	7.9	8.5	0.2	1.6		586	Stiff, Sandy silt to clayey silt			10	1.42	0.37	1 - 3	1 - 3
14.0	10.8	11.6	0.1	1.1		518	Stiff, Sandy silt to clayey silt			15	1.33	0.24	1 - 3	1 - 3
14.5	5.3	5.6	0.1	1.5		703	Soft, Clayey silt to silty clay			18	0.49	0.29	1 - 3	1 - 3
15.0	9.1	9.7	0.1	1.2		530	Stiff, Sandy silt to clayey silt			10	1.64	0.29	1 - 3	1 - 3
15.5	8.6	9.1	0.2	1.4		522	Stiff, Sandy silt to clayey silt			10	1.53	0.34	1 - 3	1 - 3
16.0	8.7	9.2	0.1	1.3		540	Stiff, Sandy silt to clayey silt			10	1.56	0.26	1 - 3	1 - 3
16.5	8.7	9.1	0.1	1.5		498	Stiff, Sandy silt to clayey silt			10	1.53	0.30	1 - 3	1 - 3
17.0	5.7	6.0	0.1	1.7		457	Firm, Clayey silt to silty clay			10	0.94	0.28	1 - 3	1 - 3
17.5	4.4	4.6	0.1	1.8		508	Soft, Clayey silt to silty clay			18	0.37	0.23	1 - 3	1 - 3
18.0	4.0	4.1	0.1	1.8		457	Soft, Clayey silt to silty clay			18	0.32	0.19	1 - 3	1 - 3
18.5	4.3	4.5	0.1	2.2		431	Soft, Clayey silt to silty clay			18	0.36	0.24	1 - 3	1 - 3
19.0	4.1	4.2	0.1	2.2		480	Soft, Silty clay to clay			18	0.33	0.24	1 - 3	1 - 3
19.5	4.5	4.6	0.1	1.3		517	Soft, Clayey silt to silty clay			18	0.37	0.14	1 - 3	1 - 3
20.0	3.5	3.6	0.1	1.8		449	Soft, Sensitive fine grained soil			18	0.25	0.17	0 - 1	0 - 1
20.5	2.4	2.5	0.1	3.0		479	V soft, Sensitive fine grained soil			18	0.13	0.24	0 - 1	0 - 1

STRATIGRAPHICS

JOB NO: '96-110-230
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp029

PAGE 2

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED		GENERATED PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)		SPT (N)	NORM SPT (Nf)
			FRICTION (TSF)	RATIO (%)							SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)		
21.0	2.3	2.4	0.1	3.5		494	V soft, Clay			18	0.12	0.26	0 - 1	0 - 1
21.5	2.6	2.7	0.1	2.9		519	V soft, Sensitive fine grained soil			18	0.15	0.28	0 - 1	0 - 1
22.0	7.7	7.8	0.2	1.3		440	Stiff, Sandy silt to clayey silt			10	1.28	0.31	1 - 3	1 - 3
22.5	15.6	15.7	0.4	1.5		426	Stiff, Sandy silt to clayey silt			15	1.90	0.71	3 - 4	3 - 4
23.0	32.9	33.1	0.3	0.8		415	Loose, Silty sand to sandy silt	36-37	20-40				6 - 7	6 - 7
23.5	37.4	37.5	0.4	0.8		413	Loose, Silty sand to sandy silt	36-37	20-40				6 - 7	6 - 7
24.0	39.3	39.2	0.3	0.6		392	Loose, Sand to silty sand	37-40	20-40				6 - 7	6 - 7
24.5	52.0	51.8	0.3	0.5		407	Loose, Sand to silty sand	37-40	20-40				7 - 10	7 - 10
25.0	72.7	72.1	0.5	0.7		377	Med dense, Sand to silty sand	40-42	40-60				15 - 17	15 - 17
25.5	58.6	57.9	0.2	0.2		425	Loose, Sand to silty sand	40-42	20-40				7 - 10	7 - 10
26.0	54.6	53.9	0.5	0.8		393	Loose, Sand to silty sand	37-40	20-40				10 - 12	10 - 12
26.5	52.4	51.6	0.3	0.6		392	Loose, Sand to silty sand	37-40	20-40				7 - 10	7 - 10
27.0	27.9	27.4	0.3	0.6		391	Loose, Silty sand to sandy silt	36-37	20-40				4 - 6	4 - 6
27.5	74.5	72.8	0.6	0.9		370	Med dense, Sand to silty sand	37-40	40-60				17 - 20	17 - 20

NOTES: * Indicates lightly overconsolidated soil
 ** Indicates heavily overconsolidated or cemented soil

Mixed soils containing both granular and fine grained particles (e.g. clayey sands) may undergo partial drained failure during CPT. Both undrained and drained parameters can be estimated for these soils.

Structure rate of loading should be considered in choosing which strength parameters to use for design. Drained and undrained parameters must not be combined as such combination will result in significant overprediction of in situ shear strength.

STRATIGRAPHICS

JOB NO: '96-110-230
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp031

PAGE 1

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED GENERATED		SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)		SPT (N)	NORM SPT (Nf)
			FRICTION (TSF)	RATIO (%)						UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)		
1.0	42.2	68.0	1.0	2.6	1442	V stiff, Sandy silt to sandy clay			25	3.37	2.07	19 - 20	30 - 33
1.5	24.2	36.9	0.6	1.7	1335	Med dense, Silty sand to sandy silt	27-31	40-60				7 - 8	10 - 12
2.0	37.0	54.0	0.5	1.7	1373	Med dense, Silty sand to sandy silt	36-37	40-60				12 - 14	17 - 20
2.5	10.7	15.1	0.4	1.5	1278	Stiff, Sandy silt to clayey silt			15	1.40	0.74	1 - 2	1 - 3
3.0	5.0	6.9	0.1	1.1	1814	Firm, Sandy silt to clayey silt			10	0.96	0.15	1 - 2	1 - 3
3.5	5.5	7.4	0.1	2.1	1826	Stiff, Clayey silt to silty clay			10	1.06	0.24	1 - 2	1 - 3
4.0	4.2	5.5	0.1	1.1	1965	Soft, Sandy silt to clayey silt			18	0.44	0.22	1 - 2	1 - 3
4.5	18.4	23.6	0.2	1.2	1276	Loose, Silty sand to sandy silt	27-31	20-40				3 - 5	4 - 6
5.0	13.0	16.5	0.3	1.7	1066	Stiff, Sandy silt to clayey silt			15	1.70	0.58	2 - 3	3 - 4
5.5	7.1	8.8	0.2	2.5	1706	Stiff, Clayey silt to silty clay			10	1.35	0.46	1 - 2	1 - 3
6.0	8.6	10.5	0.3	2.4	1675	Stiff, Clayey silt to silty clay			15	1.10	0.50	1 - 2	1 - 3
6.5	11.6	14.0	0.3	2.5	1495	Stiff, Clayey silt to silty clay			15	1.49	0.55	2 - 3	3 - 4
7.0	6.1	7.2	0.1	1.3	1676	Stiff, Sandy silt to clayey silt			10	1.13	0.20	1 - 3	1 - 3
7.5	6.2	7.3	0.2	2.3	1566	Stiff, Clayey silt to silty clay			10	1.15	0.30	1 - 3	1 - 3
8.0	5.9	6.8	0.0	0.6	1587	Stiff, Sandy silt to clayey silt			10	1.08	0.07	1 - 3	1 - 3
8.5	12.1	13.9	0.2	1.5	1247	Stiff, Sandy silt to clayey silt			15	1.55	0.32	1 - 3	1 - 3
9.0	12.9	14.7	0.1	0.8	1148	V loose, Silty sand to sandy silt	31-36	0-20				1 - 3	1 - 3
9.5	10.8	12.1	0.1	0.5	1189	V loose, Silty sand to sandy silt	27-31	0-20				1 - 3	1 - 3
10.0	12.4	13.8	0.1	0.8	1084	V loose, Silty sand to sandy silt	27-31	0-20				1 - 3	1 - 3
10.5	13.1	14.5	0.2	1.4	1241	Stiff, Sandy silt to clayey silt			15	1.67	0.41	1 - 3	1 - 3
11.0	16.5	18.2	0.2	1.4	1173	Loose, Silty sand to sandy silt	27-31	20-40				3 - 4	3 - 4
11.5	11.0	12.1	0.3	2.1	996	Stiff, Clayey silt to silty clay			15	1.38	0.63	1 - 3	1 - 3
12.0	14.9	16.3	0.1	0.8	1191	V loose, Silty sand to sandy silt	31-36	0-20				1 - 3	1 - 3
12.5	18.5	20.1	0.2	1.0	1034	Loose, Silty sand to sandy silt	27-31	20-40				3 - 4	3 - 4
13.0	8.5	9.2	0.2	1.7	1166	Stiff, Clayey silt to silty clay			10	1.54	0.49	1 - 3	1 - 3
13.5	6.1	6.6	0.1	2.1	1529	Stiff, Clayey silt to silty clay			10	1.06	0.28	1 - 3	1 - 3
14.0	6.3	6.7	0.1	1.6	1399	Stiff, Clayey silt to silty clay			10	1.09	0.20	1 - 3	1 - 3
14.5	6.9	7.4	0.1	1.8	1344	Stiff, Clayey silt to silty clay			10	1.21	0.25	1 - 3	1 - 3
15.0	7.4	7.9	0.2	2.3	1364	Stiff, Clayey silt to silty clay			10	1.30	0.32	1 - 3	1 - 3
15.5	7.4	7.8	0.2	2.2	1340	Stiff, Clayey silt to silty clay			10	1.29	0.33	1 - 3	1 - 3
16.0	7.9	8.3	0.2	2.0	1320	Stiff, Clayey silt to silty clay			10	1.38	0.31	1 - 3	1 - 3
16.5	7.7	8.1	0.1	1.7	1280	Stiff, Clayey silt to silty clay			10	1.35	0.27	1 - 3	1 - 3
17.0	7.9	8.3	0.1	1.9	1227	Stiff, Clayey silt to silty clay			10	1.37	0.30	1 - 3	1 - 3
17.5	7.5	7.8	0.1	1.5	1213	Stiff, Clayey silt to silty clay			10	1.29	0.24	1 - 3	1 - 3
18.0	7.3	7.6	0.1	1.3	1169	Stiff, Sandy silt to clayey silt			10	1.24	0.20	1 - 3	1 - 3
18.5	8.2	8.5	0.1	1.8	1131	Stiff, Clayey silt to silty clay			10	1.41	0.29	1 - 3	1 - 3
19.0	7.6	7.9	0.1	1.3	1090	Stiff, Sandy silt to clayey silt			10	1.30	0.20	1 - 3	1 - 3
19.5	7.7	7.9	0.1	1.3	1125	Stiff, Sandy silt to clayey silt			10	1.31	0.21	1 - 3	1 - 3
20.0	8.6	8.8	0.2	2.4	1026	Stiff, Clayey silt to silty clay			10	1.47	0.39	1 - 3	1 - 3
20.5	7.8	7.9	0.2	2.1	1110	Stiff, Clayey silt to silty clay			10	1.31	0.34	1 - 3	1 - 3

STRATIGRAPHICS

JOB NO: '96-110-230
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp031

PAGE 2

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED GENERATED		SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED LARGE SHEAR STRENGTH (KSF)		SPT (N)	NORM SPT (Nf)
			FRICTION (TSF)	RATIO (%)						SHEAR STRENGTH (KSF)	SHEAR STRENGTH (KSF)		
21.0	8.0	8.2	0.1	1.7	1116	Stiff, Clayey silt to silty clay			10	1.35	0.26	1 - 3	1 - 3
21.5	8.1	8.2	0.1	1.7	1080	Stiff, Clayey silt to silty clay			10	1.37	0.27	1 - 3	1 - 3
22.0	8.1	8.2	0.1	1.7	1074	Stiff, Clayey silt to silty clay			10	1.35	0.27	1 - 3	1 - 3
22.5	8.8	8.9	0.2	1.9	1074	Stiff, Clayey silt to silty clay			10	1.49	0.33	1 - 3	1 - 3
23.0	8.3	8.3	0.1	1.8	1096	Stiff, Clayey silt to silty clay			10	1.38	0.29	1 - 3	1 - 3
23.5	7.6	7.6	0.2	1.9	1076	Stiff, Clayey silt to silty clay			10	1.23	0.31	1 - 3	1 - 3
24.0	7.4	7.4	0.1	1.9	1060	Stiff, Clayey silt to silty clay			10	1.20	0.29	1 - 3	1 - 3
24.5	7.1	7.1	0.1	0.9	1044	Stiff, Sandy silt to clayey silt			10	1.13	0.12	1 - 3	1 - 3
25.0	6.7	6.6	0.1	0.4	973	Stiff, Sensitive fine grained soil			10	1.04	0.26	1 - 3	1 - 3
25.5	45.3	44.9	0.2	0.4	659	Loose, Sand to silty sand	37-40	20-40				7 - 10	7 - 10
26.0	34.7	34.3	0.2	0.4	562	Loose, Sand to silty sand	36-37	20-40				4 - 6	4 - 6
26.5	12.6	12.4	0.1	0.5	607	V loose, Silty sand to sandy silt	31-36	0-20				1 - 3	1 - 3
27.0	9.8	9.6	0.1	1.0	771	Stiff, Sandy silt to clayey silt			10	1.64	0.26	1 - 3	1 - 3
27.5	21.3	20.9	0.2	0.7	721	Loose, Silty sand to sandy silt	31-36	20-40				3 - 4	3 - 4
28.0	34.2	33.3	0.2	0.3	631	Loose, Sand to silty sand	36-37	20-40				4 - 6	4 - 6
28.5	94.8	92.2	0.3	0.3	583	Med dense, Sand to silty sand	40-42	40-60				17 - 21	17 - 20
29.0	99.2	96.2	0.6	0.6	546	Med dense, Sand to silty sand	40-42	40-60				21 - 24	20 - 23
29.5	62.9	60.8	0.3	0.4	521	Loose, Sand to silty sand	40-42	20-40				10 - 12	10 - 12
30.0	63.0	60.7	0.3	0.4	556	Loose, Sand to silty sand	40-42	20-40				10 - 12	10 - 12
30.5	32.6	31.3	0.8	1.6	519	Loose, Silty sand to sandy silt	27-31	20-40				7 - 10	7 - 10
31.0	12.2	11.7	0.3	1.4	661	Stiff, Sandy silt to clayey silt			15	1.38	0.69	1 - 3	1 - 3
31.5	55.4	53.0	0.2	0.4	728	Loose, Sand to silty sand	37-40	20-40				7 - 10	7 - 10
32.0	41.7	39.8	0.6	0.6	579	Loose, Sand to silty sand	37-40	20-40				6 - 7	6 - 7
32.5	142.5	135.5	0.9	0.8	627	Med dense, Sand to silty sand	40-42	40-60				35 - 42	33 - 40
33.0	110.2	104.6	1.3	1.1	508	Med dense, Sand to silty sand	40-42	40-60				32 - 35	30 - 33
33.5	71.4	67.6	1.1	1.2	517	Med dense, Silty sand to sandy silt	37-40	40-60				18 - 21	17 - 20
34.0	57.5	54.3	0.8	1.1	608	Med dense, Silty sand to sandy silt	37-40	40-60				13 - 16	12 - 15
34.5	14.2	13.3	0.7	2.5	518	Stiff, Clayey silt to silty clay			15	1.61	1.34	3 - 4	3 - 4
35.0	10.1	9.5	0.1	0.9	829	V loose, Silty sand to sandy silt	27-31	0-20				1 - 3	1 - 3
35.5	40.9	38.3	0.2	0.8	677	Loose, Silty sand to sandy silt	36-37	20-40				7 - 11	7 - 10
36.0	20.8	19.4	0.4	1.3	566	Loose, Silty sand to sandy silt	27-31	20-40				3 - 4	3 - 4
36.5	17.5	16.3	0.4	2.0	590	V stiff, Sandy silt to clayey silt			15	2.05	0.82	4 - 6	4 - 6
37.0	22.7	21.1	0.4	1.7	540	Loose, Silty sand to sandy silt	27-31	20-40				4 - 6	4 - 6
37.5	25.5	23.6	0.4	1.4	521	Loose, Silty sand to sandy silt	27-31	20-40				4 - 6	4 - 6
38.0	28.2	26.1	0.4	1.3	516	Loose, Silty sand to sandy silt	27-31	20-40				6 - 8	6 - 7
38.5	27.5	25.4	0.3	1.0	513	Loose, Silty sand to sandy silt	31-36	20-40				4 - 7	4 - 6
39.0	26.6	24.5	0.3	1.2	519	Loose, Silty sand to sandy silt	27-31	20-40				4 - 7	4 - 6
39.5	29.6	27.1	0.4	1.2	505	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
40.0	37.7	34.6	0.5	1.2	476	Loose, Silty sand to sandy silt	36-37	20-40				8 - 11	7 - 10
40.5	41.2	37.7	0.5	1.3	467	Loose, Silty sand to sandy silt	36-37	20-40				8 - 11	7 - 10

STRATIGRAPHICS

PAGE 3

JOB NO: '96-110-230
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp031

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED GENERATED			SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (Nf)
			FRICTION (TSF)	RATIO (%)	PORE WATER PRESSURE (TSF)								
41.0	47.2	43.1	0.5	1.2	458	Loose, Silty sand to sandy silt	36-37	20-40				11 - 13	10 - 12
41.5	43.4	39.5	0.4	0.9	464	Loose, Silty sand to sandy silt	36-37	20-40				8 - 11	7 - 10
42.0	40.3	36.6	0.4	0.9	458	Loose, Silty sand to sandy silt	36-37	20-40				8 - 11	7 - 10
42.5	34.4	31.1	0.4	1.2	456	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
43.0	33.3	30.1	0.3	1.1	456	Loose, Silty sand to sandy silt	36-37	20-40				7 - 8	6 - 7
43.5	31.9	28.8	0.4	1.2	460	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
44.0	28.2	25.4	0.4	1.5	479	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
44.5	26.4	23.7	0.5	1.8	513	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
45.0	26.6	23.8	0.6	2.1	522	V stiff, Sandy silt to sandy clay			20	2.39	1.11	7 - 8	6 - 7
45.5	26.8	23.9	0.6	2.1	519	V stiff, Sandy silt to sandy clay			20	2.40	1.17	7 - 8	6 - 7
46.0	29.6	26.4	0.8	2.7	539	V stiff, Sandy silt to sandy clay			20	2.68	1.65	11 - 13	10 - 12
46.5	31.4	28.0	1.0	3.3	535	V stiff, Sandy clay to silty clay *			20	2.86	2.05	13 - 17	12 - 15
47.0	30.5	27.1	0.9	2.9	532	V stiff, Sandy clay to silty clay *			20	2.77	1.79	11 - 14	10 - 12
47.5	29.4	26.1	0.8	2.5	525	V stiff, Sandy silt to sandy clay			20	2.66	1.51	8 - 11	7 - 10
48.0	28.9	25.6	0.6	2.1	508	V stiff, Sandy silt to sandy clay			20	2.60	1.24	8 - 11	7 - 10
48.5	29.5	26.0	0.5	1.7	480	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
49.0	27.9	24.6	0.4	1.5	481	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
49.5	25.7	22.6	0.4	1.4	482	Loose, Silty sand to sandy silt	27-31	20-40				5 - 7	4 - 6
50.0	25.6	22.5	0.4	1.6	486	Loose, Silty sand to sandy silt	27-31	20-40				5 - 7	4 - 6
50.5	24.5	21.4	0.4	1.6	501	Loose, Silty sand to sandy silt	27-31	20-40				5 - 7	4 - 6
51.0	25.0	21.8	0.4	1.7	518	V stiff, Sandy silt to clayey silt			15	2.92	0.87	5 - 7	4 - 6
51.5	25.3	22.1	0.4	1.7	502	Loose, Silty sand to sandy silt	27-31	20-40				5 - 7	4 - 6
52.0	27.2	23.7	0.4	1.4	484	Loose, Silty sand to sandy silt	27-31	20-40				5 - 7	4 - 6
52.5	29.5	25.6	0.5	1.5	480	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
53.0	28.8	25.0	0.4	1.4	475	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
53.5	27.2	23.5	0.4	1.3	487	Loose, Silty sand to sandy silt	27-31	20-40				5 - 7	4 - 6
54.0	26.1	22.5	0.4	1.4	502	Loose, Silty sand to sandy silt	27-31	20-40				5 - 7	4 - 6
54.5	31.0	26.7	0.5	1.6	478	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
55.0	31.5	27.1	0.4	1.4	485	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
55.5	29.6	25.4	0.5	1.5	491	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
56.0	34.0	29.1	0.5	1.5	476	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
56.5	33.1	28.3	0.5	1.5	480	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
57.0	33.5	28.6	0.6	1.6	479	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
57.5	36.8	31.4	0.6	1.5	480	Loose, Silty sand to sandy silt	27-31	20-40				8 - 12	7 - 10
58.0	40.6	34.5	0.7	1.7	469	Med dense, Silty sand to sandy silt	27-31	40-60				8 - 12	7 - 10
58.5	39.5	33.5	0.6	1.4	470	Loose, Silty sand to sandy silt	27-31	20-40				8 - 12	7 - 10
59.0	34.4	29.2	0.5	1.4	486	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
59.5	28.2	23.8	0.5	1.5	506	Loose, Silty sand to sandy silt	27-31	20-40				5 - 7	4 - 6

NOTES: * Indicates lightly overconsolidated soil
 ** Indicates heavily overconsolidated or cemented soil

Mixed soils containing both granular and fine grained particles (e.g. clayey sands) may undergo partial drained failure during CPT. Both undrained and drained parameters can be estimated for these soils.

Structure rate of loading should be considered in choosing which strength parameters to use for design. Drained and undrained parameters must not be combined as such combination will result in significant overprediction of in situ shear strength.

STRATIGRAPHICS

JOB NO: '96-110-230
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp035

PAGE 1

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED FRICTION (TSF)	GENERATED PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (N)
1.0	51.2	82.4	1.3	2.9	981	V stiff, Sandy silt to sandy clay			30	3.41	2.51	29 - 37	46 - 60
1.5	36.5	55.6	0.9	2.2	1278	Dense, Silty sand to sandy silt	27-31	60-80				13 - 15	20 - 23
2.0	24.5	35.9	0.6	2.2	1424	V stiff, Sandy silt to sandy clay			20	2.44	1.28	8 - 10	12 - 15
2.5	30.3	42.8	0.2	0.8	1216	Loose, Silty sand to sandy silt	36-37	20-40				5 - 7	7 - 10
3.0	20.3	27.8	0.2	0.7	1093	Loose, Silty sand to sandy silt	36-37	20-40				3 - 4	4 - 6
3.5	14.2	19.0	0.1	0.3	1066	V loose, Silty sand to sandy silt	31-36	0-20				1 - 2	1 - 3
4.0	7.7	10.1	0.1	1.0	1084	Stiff, Sandy silt to clayey silt			10	1.49	0.21	1 - 2	1 - 3
4.5	6.6	8.5	0.1	1.4	951	Stiff, Sandy silt to clayey silt			10	1.27	0.19	1 - 2	1 - 3
5.0	5.2	6.6	0.1	1.4	1009	Firm, Clayey silt to silty clay			10	0.99	0.18	1 - 2	1 - 3
5.5	3.8	4.7	0.0	0.4	1102	Soft, Sensitive fine grained soil			18	0.38	0.03	1 - 2	1 - 3
6.0	4.0	4.9	0.0	1.0	1076	Soft, Sensitive fine grained soil			18	0.40	0.08	1 - 2	1 - 3
6.5	4.2	5.1	0.0	0.8	1049	Soft, Sensitive fine grained soil			18	0.43	0.06	1 - 2	1 - 3
7.0	3.8	4.5	0.0	0.4	1087	Soft, Sensitive fine grained soil			18	0.37	0.05	0 - 1	0 - 1
7.5	8.0	9.4	0.1	1.2	921	Stiff, Sandy silt to clayey silt			10	1.52	0.18	1 - 3	1 - 3
8.0	6.3	7.3	0.0	0.3	807	V loose, Sensitive fine grained soil	27-31	0-20				1 - 3	1 - 3
8.5	3.8	4.4	0.0	0.7	939	Soft, Sensitive fine grained soil			18	0.37	0.07	0 - 1	0 - 1
9.0	5.0	5.7	0.2	1.6	1047	Soft, Clayey silt to silty clay			18	0.50	0.32	1 - 3	1 - 3
9.5	11.4	12.8	0.1	0.6	684	V loose, Silty sand to sandy silt	27-31	0-20				1 - 3	1 - 3
10.0	21.6	24.0	0.1	0.5	568	Loose, Silty sand to sandy silt	31-36	20-40				3 - 4	3 - 4
10.5	13.7	15.2	0.1	0.4	468	V loose, Silty sand to sandy silt	31-36	0-20				1 - 3	1 - 3
11.0	6.6	7.3	0.2	1.8	431	Stiff, Clayey silt to silty clay			10	1.20	0.32	1 - 3	1 - 3
11.5	7.8	8.5	0.4	5.0	577	Stiff, Silty clay to clay *			10	1.42	0.77	4 - 5	4 - 6
12.0	6.6	7.2	0.5	6.0	634	Firm, Silty clay to clay *			12	0.98	0.90	4 - 6	4 - 6
12.5	7.0	7.6	0.5	5.8	613	Stiff, Silty clay to clay *			12	1.05	1.03	4 - 6	4 - 6
13.0	11.3	12.3	0.6	5.2	646	Stiff, Silty clay to clay *			15	1.41	1.25	6 - 9	7 - 10
13.5	12.6	13.6	0.6	4.9	666	Stiff, Silty clay to clay *			15	1.57	1.21	6 - 9	7 - 10
14.0	13.0	13.9	0.5	4.4	656	Stiff, Silty clay to clay *			15	1.62	1.08	7 - 9	7 - 10
14.5	12.0	12.9	0.5	3.9	654	Stiff, Silty clay to clay *			15	1.49	0.97	6 - 7	6 - 7
15.0	12.3	13.1	0.5	3.6	668	Stiff, Silty clay to clay *			15	1.52	0.90	4 - 6	4 - 6
15.5	12.8	13.6	0.4	3.3	646	Stiff, Silty clay to clay *			15	1.59	0.85	4 - 6	4 - 6
16.0	12.6	13.3	0.4	3.2	646	Stiff, Sandy clay to silty clay *			15	1.55	0.84	4 - 6	4 - 6
16.5	12.4	13.0	0.5	3.6	647	Stiff, Silty clay to clay *			15	1.52	0.93	4 - 6	4 - 6
17.0	12.6	13.2	0.5	3.6	646	Stiff, Silty clay to clay *			15	1.54	0.92	4 - 6	4 - 6
17.5	10.9	11.4	0.4	3.3	638	Stiff, Silty clay to clay			15	1.32	0.78	4 - 6	4 - 6
18.0	10.9	11.4	0.3	2.8	623	Stiff, Clayey silt to silty clay			15	1.31	0.61	3 - 4	3 - 4
18.5	11.0	11.4	0.2	2.1	635	Stiff, Clayey silt to silty clay			15	1.32	0.46	1 - 3	1 - 3
19.0	11.2	11.6	0.3	2.6	635	Stiff, Clayey silt to silty clay			15	1.34	0.61	3 - 4	3 - 4
19.5	10.1	10.4	0.2	1.9	635	Stiff, Clayey silt to silty clay			15	1.19	0.41	1 - 3	1 - 3
20.0	10.7	10.9	0.1	1.2	630	Stiff, Sandy silt to clayey silt			15	1.26	0.23	1 - 3	1 - 3
20.5	10.2	10.4	0.2	1.8	629	Stiff, Sandy silt to clayey silt			15	1.19	0.36	1 - 3	1 - 3

STRATIGRAPHICS

JOB NO: '96-110-230
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp035

PAGE 2

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED FRICTION (TSF)	GENERATED RATIO (%)	PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (US/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (Nf)
21.0	10.0	10.1	0.1	1.1		629	Stiff, Sandy silt to clayey silt			10	1.74	0.22	1 - 3	1 - 3
21.5	11.6	11.8	0.3	1.9		613	Stiff, Sandy silt to clayey silt			15	1.37	0.55	1 - 3	1 - 3
22.0	11.1	11.2	0.3	2.0		580	Stiff, Clayey silt to silty clay			15	1.30	0.59	1 - 3	1 - 3
22.5	12.8	12.9	0.3	2.1		591	Stiff, Clayey silt to silty clay			15	1.52	0.56	3 - 4	3 - 4
23.0	10.6	10.6	0.3	2.2		557	Stiff, Clayey silt to silty clay			15	1.23	0.54	1 - 3	1 - 3
23.5	16.7	16.7	0.3	2.2		554	V stiff, Sandy silt to clayey silt			15	2.03	0.53	4 - 6	4 - 6
24.0	7.9	7.9	0.2	1.7		590	Stiff, Clayey silt to silty clay			10	1.30	0.43	1 - 3	1 - 3
24.5	8.1	8.1	0.1	1.0		628	Stiff, Sandy silt to clayey silt			10	1.33	0.16	1 - 3	1 - 3
25.0	8.5	8.4	0.1	0.8		618	Stiff, Sandy silt to clayey silt			10	1.40	0.13	1 - 3	1 - 3
25.5	8.8	8.7	0.1	1.1		613	Stiff, Sandy silt to clayey silt			10	1.44	0.18	1 - 3	1 - 3
26.0	8.1	8.0	0.1	0.8		605	Stiff, Sandy silt to clayey silt			10	1.31	0.14	1 - 3	1 - 3
26.5	12.8	12.6	0.1	0.3		575	V loose, Silty sand to sandy silt	31-36	0-20				1 - 3	1 - 3
27.0	21.2	20.8	0.6	2.0		442	V stiff, Sandy silt to sandy clay			15	2.61	1.10	6 - 7	6 - 7
27.5	18.5	18.1	0.4	1.5		580	Loose, Silty sand to sandy silt	27-31	20-40				3 - 4	3 - 4
28.0	39.1	38.1	0.5	1.3		572	Loose, Silty sand to sandy silt	36-37	20-40				7 - 10	7 - 10
28.5	30.8	30.0	0.6	1.8		560	Med dense, Silty sand to sandy silt	27-31	40-60				7 - 10	7 - 10
29.0	27.6	26.8	0.7	2.1		648	V stiff, Sandy silt to sandy clay			20	2.59	1.35	7 - 10	7 - 10
29.5	11.7	11.3	0.3	1.7		742	Stiff, Sandy silt to clayey silt			15	1.32	0.64	1 - 3	1 - 3
30.0	17.2	16.6	0.3	1.3		738	Loose, Silty sand to sandy silt	27-31	20-40				3 - 4	3 - 4
30.5	24.3	23.4	0.7	2.5		658	V stiff, Sandy silt to sandy clay			20	2.25	1.38	7 - 10	7 - 10
31.0	30.6	29.4	0.8	2.7		694	V stiff, Sandy silt to sandy clay			20	2.88	1.54	10 - 13	10 - 12
31.5	41.5	39.7	0.7	1.1		691	Loose, Silty sand to sandy silt	36-37	20-40				7 - 10	7 - 10
32.0	55.3	52.7	1.0	1.7		625	Med dense, Silty sand to sandy silt	36-37	40-60				18 - 21	17 - 20
32.5	42.4	40.3	0.9	1.9		677	Med dense, Silty sand to sandy silt	27-31	40-60				13 - 16	12 - 15
33.0	32.7	31.0	0.9	1.3		659	Loose, Silty sand to sandy silt	27-31	20-40				6 - 7	6 - 7
33.5	86.7	82.0	1.0	1.3		634	Med dense, Silty sand to sandy silt	37-40	40-60				24 - 32	23 - 30
34.0	101.5	95.8	0.9	1.1		650	Med dense, Sand to silty sand	40-42	40-60				32 - 35	30 - 33
34.5	38.5	36.3	1.1	1.5		609	Med dense, Silty sand to sandy silt	27-31	40-60				7 - 11	7 - 10
35.0	24.2	22.7	0.6	1.4		737	Loose, Silty sand to sandy silt	27-31	20-40				4 - 6	4 - 6
35.5	68.9	64.5	0.7	1.4		679	Med dense, Silty sand to sandy silt	37-40	40-60				18 - 21	17 - 20
36.0	24.0	22.4	1.0	2.1		647	V stiff, Sandy silt to sandy clay			20	2.18	1.90	6 - 7	6 - 7
36.5	28.3	26.4	0.7	2.6		775	V stiff, Sandy silt to sandy clay			20	2.61	1.36	11 - 13	10 - 12
37.0	18.8	17.5	0.5	1.1		879	Loose, Silty sand to sandy silt	27-31	20-40				3 - 4	3 - 4
37.5	40.9	37.9	1.0	1.7		677	Med dense, Silty sand to sandy silt	27-31	40-60				11 - 13	10 - 12
38.0	79.8	73.8	0.9	1.1		722	Med dense, Sand to silty sand	37-40	40-60				22 - 25	20 - 23
38.5	45.3	41.8	1.3	1.9		652	Med dense, Silty sand to sandy silt	27-31	40-60				13 - 16	12 - 15
39.0	39.8	36.7	1.0	2.6		743	V stiff, Sandy silt to sandy clay			25	3.00	1.96	16 - 18	15 - 17
39.5	32.8	30.2	0.4	1.1		680	Loose, Silty sand to sandy silt	36-37	20-40				7 - 8	6 - 7
40.0	40.0	36.6	0.2	0.5		658	Loose, Sand to silty sand	36-37	20-40				7 - 8	6 - 7
40.5	37.4	34.2	0.4	0.9		659	Loose, Silty sand to sandy silt	36-37	20-40				7 - 8	6 - 7

STRATIGRAPHICS

JOB NO: '96-110-230
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp035

PAGE 3

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED FRICTION (TSF)	GENERATED RATIO (%)	PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Hc	UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (Nf)
41.0	32.9	30.0	0.3	0.9		685	Loose, Silty sand to sandy silt	36-37	20-40				7 - 8	6 - 7
41.5	32.2	29.3	0.3	1.0		709	Loose, Silty sand to sandy silt	31-36	20-40				7 - 8	6 - 7
42.0	30.9	28.1	0.2	0.9		722	Loose, Silty sand to sandy silt	36-37	20-40				4 - 7	4 - 6
42.5	31.5	28.5	0.5	1.6		746	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
43.0	31.5	28.5	0.5	1.6		758	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
43.5	32.1	29.0	0.6	1.9		758	Med dense, Silty sand to sandy silt	27-31	40-60				8 - 11	7 - 10
44.0	33.1	29.8	0.7	2.0		768	V stiff, Sandy silt to sandy clay			20	3.05	1.36	8 - 11	7 - 10
44.5	32.5	29.2	0.4	2.1		759	V stiff, Sandy silt to sandy clay			20	2.98	0.81	8 - 11	7 - 10

NOTES: * Indicates lightly overconsolidated soil
 ** Indicates heavily overconsolidated or cemented soil

Mixed soils containing both granular and fine grained particles (e.g. clayey sands) may undergo partial drained failure during CPT. Both undrained and drained parameters can be estimated for these soils.

Structure rate of loading should be considered in choosing which strength parameters to use for design. Drained and undrained parameters must not be combined as such combination will result in significant overprediction of in situ shear strength.

STRATIGRAPHICS

PAGE 1

JOB NO: '96-110-230
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp037

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED GENERATED			SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (Nf)
			FRICTION (TSF)	RATIO (%)	PORE WATER PRESSURE (TSF)									
1.0	189.6	305.4	4.7	1.7		697	V dense, Sa gravel to si gr sand	42-46	80-100				+ 62	+ 100
1.5	76.4	116.3	1.5	1.2		712	Med dense, Sand to silty sand	40-42	40-60				22 - 26	33 - 40
2.0	62.4	91.1	0.7	1.1		741	Med dense, Sand to silty sand	40-42	40-60				16 - 21	23 - 30
2.5	50.2	70.9	0.4	0.7		792	Med dense, Sand to silty sand	40-42	40-60				11 - 12	15 - 17
3.0	64.3	88.3	0.5	0.8		794	Med dense, Sand to silty sand	40-42	40-60				15 - 17	20 - 23
3.5	72.3	96.7	0.9	1.1		785	Med dense, Sand to silty sand	40-42	40-60				22 - 25	30 - 33
4.0	64.6	84.6	0.9	1.2		835	Med dense, Sand to silty sand	37-40	40-60				18 - 23	23 - 30
4.5	66.9	85.9	0.9	1.4		821	Med dense, Silty sand to sandy silt	37-40	40-60				18 - 23	23 - 30
5.0	60.2	76.0	0.8	1.3		828	Med dense, Silty sand to sandy silt	37-40	40-60				16 - 18	20 - 23
5.5	36.5	45.3	0.9	1.9		874	Med dense, Silty sand to sandy silt	27-31	40-60				12 - 14	15 - 17
6.0	22.9	28.0	0.6	2.1		929	V stiff, Sandy silt to sandy clay			20	2.25	1.20	6 - 8	7 - 10
6.5	25.0	30.1	0.7	1.9		961	Med dense, Silty sand to sandy silt	27-31	40-60				6 - 8	7 - 10
7.0	49.4	58.7	0.3	1.1		891	Med dense, Silty sand to sandy silt	37-40	40-60				13 - 14	15 - 17
7.5	38.6	45.2	1.4	3.0		887	V stiff, Sandy silt to sandy clay			25	3.05	2.87	17 - 20	20 - 23
8.0	21.6	25.1	0.8	2.6		916	V stiff, Sandy silt to sandy clay			20	2.11	1.61	6 - 9	7 - 10
8.5	43.0	49.3	0.7	1.3		903	Med dense, Silty sand to sandy silt	36-37	40-60				10 - 13	12 - 15
9.0	59.8	67.8	0.3	0.4		824	Loose, Sand to silty sand	40-42	20-40				11 - 13	12 - 15
9.5	79.1	88.8	0.4	0.5		746	Med dense, Sand to silty sand	40-42	40-60				15 - 18	17 - 20
10.0	90.1	100.1	0.6	0.7		625	Med dense, Sand to silty sand	40-42	40-60				21 - 27	23 - 30
10.5	70.6	78.0	0.4	0.5		586	Med dense, Sand to silty sand	40-42	40-60				15 - 18	17 - 20
11.0	80.5	88.6	0.3	0.5		578	Med dense, Sand to silty sand	40-42	40-60				15 - 18	17 - 20
11.5	73.6	80.6	0.6	0.8		540	Med dense, Sand to silty sand	40-42	40-60				18 - 21	20 - 23
12.0	32.8	35.8	0.8	1.3		496	Loose, Silty sand to sandy silt	36-37	20-40				6 - 9	7 - 10
12.5	9.3	10.1	0.3	2.0		696	Stiff, Clayey silt to silty clay			15	1.15	0.68	1 - 3	1 - 3
13.0	7.9	8.5	0.1	0.9		753	Stiff, Sandy silt to clayey silt			10	1.42	0.14	1 - 3	1 - 3
13.5	7.9	8.5	0.1	0.8		789	Stiff, Sandy silt to clayey silt			10	1.42	0.13	1 - 3	1 - 3
14.0	5.4	5.8	0.1	0.8		569	Firm, Sandy silt to clayey silt			18	0.51	0.12	1 - 3	1 - 3
14.5	6.3	6.7	0.0	0.5		762	Stiff, Sensitive fine grained soil			10	1.08	0.06	1 - 3	1 - 3
15.0	6.6	7.1	0.0	0.1		768	, Sensitive fine grained soil	27-31	10				1 - 3	1 - 3
15.5	7.9	8.4	0.0	0.5		748	V loose, Silty sand to sandy silt	27-31	0-20				1 - 3	1 - 3
16.0	7.9	8.3	0.0	0.2		755	V loose, Silty sand to sandy silt	27-31	0-20				1 - 3	1 - 3
16.5	5.8	6.1	0.1	1.3		700	Firm, Sandy silt to clayey silt			10	0.97	0.27	1 - 3	1 - 3
17.0	22.7	23.8	0.2	0.4		628	V loose, Silty sand to sandy silt	31-36	0-20				3 - 4	3 - 4
17.5	57.6	60.2	0.5	0.5		518	Loose, Sand to silty sand	37-40	20-40				10 - 11	10 - 12
18.0	129.2	134.4	0.9	0.6		490	Med dense, Sand to silty sand	40-42	40-60				32 - 38	33 - 40
18.5	130.1	134.8	1.3	0.9		468	Med dense, Sand to silty sand	40-42	40-60				39 - 44	40 - 46
19.0	65.6	67.7	1.4	1.3		480	Med dense, Silty sand to sandy silt	37-40	40-60				19 - 22	20 - 23
19.5	28.0	28.9	0.6	1.6		489	Loose, Silty sand to sandy silt	27-31	20-40				7 - 10	7 - 10
20.0	9.9	10.1	0.3	1.6		612	Stiff, Sandy silt to clayey silt			15	1.15	0.61	1 - 3	1 - 3
20.5	14.3	14.6	0.1	1.0		607	Loose, Silty sand to sandy silt	27-31	20-40				1 - 3	1 - 3

STRATIGRAPHICS

JOB NO: '96-110-230
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp037

PAGE 2

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED FRICTION		GENERATED PORE WATER PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED SHEAR STRENGTH (KSF)	UNDRAINED LARGE STRAIN SHEAR STRENGTH (KSF)	SPT (N)	NORM SPT (Nf)
			FRICTION (TSF)	RATIO (%)										
21.0	15.3	15.6	0.2	0.4		487	V loose, Silty sand to sandy silt	31-36	0-20				1 - 3	1 - 3
21.5	98.8	100.3	0.6	0.7		472	Med dense, Sand to silty sand	40-42	40-60				23 - 30	23 - 30
22.0	55.4	56.0	1.2	1.2		511	Med dense, Silty sand to sandy silt	37-40	40-60				15 - 17	15 - 17
22.5	35.1	35.4	0.2	0.5		524	Loose, Sand to silty sand	36-37	20-40				6 - 7	6 - 7
23.0	29.1	29.2	0.3	0.8		531	Loose, Silty sand to sandy silt	36-37	20-40				4 - 6	4 - 6
23.5	24.4	24.4	0.2	0.9		513	Loose, Silty sand to sandy silt	31-36	20-40				4 - 6	4 - 6
24.0	24.4	24.3	0.2	0.9		502	Loose, Silty sand to sandy silt	31-36	20-40				4 - 6	4 - 6
24.5	25.7	25.6	0.2	0.7		502	Loose, Silty sand to sandy silt	31-36	20-40				4 - 6	4 - 6
25.0	26.2	26.0	0.2	0.8		499	Loose, Silty sand to sandy silt	31-36	20-40				4 - 6	4 - 6
25.5	27.5	27.2	0.3	1.0		486	Loose, Silty sand to sandy silt	31-36	20-40				4 - 6	4 - 6
26.0	28.5	28.1	0.3	1.1		479	Loose, Silty sand to sandy silt	31-36	20-40				6 - 7	6 - 7
26.5	20.5	20.1	0.5	1.8		475	V stiff, Sandy silt to clayey silt			15	2.52	0.91	4 - 6	4 - 6
27.0	20.2	19.8	0.5	2.5		469	V stiff, Sandy clay to silty clay *			15	2.48	1.04	6 - 7	6 - 7
27.5	19.9	19.4	0.5	2.6		464	V stiff, Sandy clay to silty clay *			15	2.43	1.07	6 - 7	6 - 7
28.0	20.9	20.4	0.6	2.6		450	V stiff, Sandy clay to silty clay *			15	2.56	1.13	6 - 7	6 - 7
28.5	22.0	21.4	0.6	2.5		458	V stiff, Sandy silt to sandy clay			20	2.03	1.16	6 - 7	6 - 7
29.0	26.2	25.4	0.6	1.8		454	Med dense, Silty sand to sandy silt	27-31	40-60				6 - 7	6 - 7
29.5	43.3	41.9	0.7	1.7		444	Med dense, Silty sand to sandy silt	27-31	40-60				12 - 16	12 - 15
30.0	35.4	34.1	0.6	1.5		436	Med dense, Silty sand to sandy silt	27-31	40-60				7 - 10	7 - 10
30.5	21.9	21.0	0.5	1.7		453	V stiff, Sandy silt to clayey silt			15	2.67	0.91	4 - 6	4 - 6
31.0	20.0	19.2	0.5	2.3		453	V stiff, Sandy silt to sandy clay			15	2.42	0.98	6 - 7	6 - 7
31.5	21.7	20.7	0.6	2.5		462	V stiff, Sandy silt to sandy clay			15	2.64	1.15	6 - 7	6 - 7
32.0	26.4	25.1	0.6	2.2		458	V stiff, Sandy silt to sandy clay			20	2.44	1.17	7 - 10	7 - 10
32.5	23.6	22.4	0.5	2.1		459	V stiff, Sandy silt to sandy clay			20	2.16	1.09	6 - 7	6 - 7
33.0	21.2	20.2	0.5	2.4		479	V stiff, Sandy silt to sandy clay			15	2.57	1.07	6 - 7	6 - 7
33.5	20.4	19.3	0.6	2.5		472	V stiff, Sandy clay to silty clay *			15	2.46	1.16	6 - 7	6 - 7
34.0	28.6	27.0	0.7	2.4		457	V stiff, Sandy silt to sandy clay			20	2.65	1.33	7 - 11	7 - 10
34.5	26.8	25.3	0.7	2.4		457	V stiff, Sandy silt to sandy clay			20	2.48	1.37	7 - 11	7 - 10
35.0	27.2	25.5	0.7	2.3		450	V stiff, Sandy silt to sandy clay			20	2.51	1.33	7 - 11	7 - 10
35.5	30.9	29.0	0.7	2.3		446	V stiff, Sandy silt to sandy clay			20	2.88	1.33	11 - 13	10 - 12
36.0	23.2	21.7	0.6	2.2		453	V stiff, Sandy silt to sandy clay			15	2.81	1.23	6 - 7	6 - 7
36.5	21.9	20.4	0.6	2.5		461	V stiff, Sandy silt to sandy clay			15	2.62	1.11	6 - 8	6 - 7
37.0	21.7	20.2	0.5	2.5		464	V stiff, Sandy clay to silty clay *			15	2.60	1.10	6 - 8	6 - 7
37.5	22.3	20.7	0.6	2.7		455	V stiff, Sandy clay to silty clay *			15	2.67	1.20	6 - 8	6 - 7
38.0	23.2	21.5	0.6	2.6		453	V stiff, Sandy clay to silty clay *			20	2.10	1.22	6 - 8	6 - 7
38.5	24.1	22.2	0.6	2.6		453	V stiff, Sandy clay to silty clay *			20	2.18	1.27	8 - 11	7 - 10
39.0	25.4	23.4	0.6	2.5		457	V stiff, Sandy silt to sandy clay			20	2.31	1.30	8 - 11	7 - 10
39.5	28.1	25.8	0.6	2.0		442	V stiff, Sandy silt to sandy clay			20	2.57	1.25	8 - 11	7 - 10
40.0	35.4	32.4	0.7	1.8		448	Med dense, Silty sand to sandy silt	27-31	40-60				8 - 11	7 - 10
40.5	33.9	31.0	0.6	1.6		448	Med dense, Silty sand to sandy silt	27-31	40-60				8 - 11	7 - 10

STRATIGRAPHICS

JOB NO: '96-110-230
 JOB NAME: Zone A Charleston Naval Base, S.C.
 SOUNDING NO: cp037

PAGE 3

DEPTH (FT)	CONE (TSF)	NORM CONE (TSF)	AVERAGED FRICTION (TSF)	GENERATED RATIO (%)	Pore Water PRESSURE (TSF)	SOIL CONDUCTIVITY (uS/cm)	SOIL TYPE	DRAINED FRICTION ANGLE (DEG)	RELATIVE DENSITY (%)	Nc	UNDRAINED LARGE STRAIN		SPT (N)	NORM SPT (Nf)
											UNDRAINED SHEAR STRENGTH (KSF)	SHEAR STRENGTH (KSF)		
41.0	30.0	27.3	0.6	1.8		453	Med dense, Silty sand to sandy silt	27-31	40-60				7 - 8	6 - 7
41.5	31.6	28.7	0.7	2.2		437	V stiff, Sandy silt to sandy clay			20	2.91	1.38	8 - 11	7 - 10
42.0	34.8	31.6	0.9	2.1		436	V stiff, Sandy silt to sandy clay			20	3.23	1.73	11 - 13	10 - 12
42.5	43.6	39.5	0.8	1.9		414	Med dense, Silty sand to sandy silt	27-31	40-60				13 - 17	12 - 15
43.0	45.4	41.0	0.8	1.7		411	Med dense, Silty sand to sandy silt	27-31	40-60				13 - 17	12 - 15
43.5	38.3	34.6	0.6	1.4		423	Loose, Silty sand to sandy silt	27-31	20-40				8 - 11	7 - 10
44.0	31.1	28.0	0.6	1.6		415	Loose, Silty sand to sandy silt	27-31	20-40				7 - 8	6 - 7
44.5	29.7	26.6	0.6	2.0		414	V stiff, Sandy silt to sandy clay			20	2.70	1.16	8 - 11	7 - 10

NOTES: * Indicates lightly overconsolidated soil
 ** Indicates heavily overconsolidated or cemented soil

Mixed soils containing both granular and fine grained particles (e.g. clayey sands) may undergo partial drained failure during CPT. Both undrained and drained parameters can be estimated for these soils.

Structure rate of loading should be considered in choosing which strength parameters to use for design. Drained and undrained parameters must not be combined as such combination will result in significant overprediction of in situ shear strength.